

BASIC  
(REV. A)

|                |                         |
|----------------|-------------------------|
| BINARY TAPE    | 20392-60001             |
| SOURCE TAPES   | <del>20392</del> -80001 |
|                | 20392-80002             |
|                | 20392-80003             |
|                | 20392-80004             |
|                | 20392-80005             |
|                | 20392-80006             |
|                | 20392-80007             |
|                | 20392-80008             |
|                | 20392-80009             |
|                | 20392-80010             |
|                | 20392-80011             |
| SOURCE LISTING | 20392-90001             |

## SYMBOL TABLE

ASPB,A,B,L,T

BASIC LANGUAGE -- JANUARY 1, 1970

|       |        |
|-------|--------|
| 0001  |        |
| PREAD | 000101 |
| WRITE | 000102 |
| PUNCH | 000103 |
| REED  | 000104 |
| LWBM  | 000106 |
| FWAM  | 000110 |
| LHAM  | 000111 |
| PBUFF | 000112 |
| PBPTR | 000113 |
| FWABP | 000114 |
| FCORE | 000115 |
| SYMTF | 000116 |
| SYMTA | 000117 |
| LSTAK | 000120 |
| ASBTB | 000121 |
| SBTBE | 000122 |
| IMOFF | 000123 |
| IMON  | 000124 |
| TLINK | 000125 |
| PLSTR | 000126 |
| LISTR | 000127 |
| TLSTR | 000130 |
| .BUFA | 000131 |
| BADDR | 000132 |
| CCNT  | 000133 |
| SBUFA | 000134 |
| SBPTR | 000135 |
| TFLAG | 000136 |
| TTYFL | 000137 |
| TSTPT | 000140 |
| LSTPT | 000141 |
| HSTPT | 000142 |
| PRADD | 000143 |
| NXTST | 000144 |
| .LNUM | 000145 |
| TYPE  | 000146 |
| DSTRT | 000147 |
| NXTDT | 000150 |
| DCCNT | 000151 |
| RSYM  | 000152 |
| SIGN  | 000153 |
| EXP   | 000154 |
| XH    | 000155 |
| XL    | 000156 |
| TEMPS | 000157 |
| MLBX1 | 000171 |
| B1    | 000173 |
| B2    | 000175 |
| B3    | 000177 |
| START | 000201 |
| RUNA  | 000202 |
| FASE3 | 000203 |
| PEXMA | 000204 |
| RDYDA | 000205 |
| DRQSA | 000206 |

|       |        |
|-------|--------|
| LISTA | 000207 |
| MATA  | 000210 |
| EMATA | 000211 |
| TSRCH | 000212 |
| FNDPA | 000213 |
| CNSTA | 000214 |
| NUMCA | 000215 |
| INCHK | 000216 |
| ENOTA | 000217 |
| NUMOA | 000220 |
| PGINT | 000221 |
| OUTIA | 000222 |
| OUTSA | 000223 |
| OUTLA | 000224 |
| OUTCA | 000225 |
| GETCA | 000226 |
| DIGCA | 000227 |
| LETCA | 000230 |
| SSYMA | 000231 |
| FETCA | 000232 |
| FORMA | 000233 |
| .LOGA | 000234 |
| .EXPA | 000235 |
| .FADA | 000236 |
| .FSBA | 000237 |
| .FMPA | 000240 |
| .FDVA | 000241 |
| ARINA | 000242 |
| MPYA  | 000243 |
| FLUNA | 000244 |
| PACKA | 000245 |
| FLT   | 000246 |
| IFIXA | 000247 |
| PRNIA | 000250 |
| CHRSA | 000251 |
| ACCST | 000252 |
| DELST | 000253 |
| FDAT  | 000254 |
| LCK2A | 000255 |
| XEC4A | 000256 |
| FSC1A | 000257 |
| FOR1A | 000260 |
| FOR0A | 000261 |
| FOR0B | 000262 |
| FOR1B | 000263 |
| FR12A | 000264 |
| EOF   | 000265 |
| NOEOF | 000266 |
| E6M1A | 000267 |
| ESYN3 | 000270 |
| FSCEF | 000271 |
| E6M1A | 000272 |
| EBUFA | 000273 |
| EBFA  | 000274 |
| LBUFA | 000275 |
| LNBFA | 000276 |



|       |        |
|-------|--------|
| ERBS  | 000277 |
| RECER | 000300 |
| FOPBS | 000301 |
| STBAS | 000302 |
| XECBR | 000303 |
| ARBAS | 000304 |
| PDFBS | 000305 |
| TBLAD | 000306 |
| STTYP | 000307 |
| MATIO | 000310 |
| MCBOP | 000311 |
| PDFNS | 000312 |
| MATFN | 000313 |
| ANEXT | 000314 |
| ADATA | 000315 |
| ATHEN | 000316 |
| ATO   | 000317 |
| ASTEP | 000320 |
| ANOT  | 000321 |
| ATAB  | 000322 |
| MBXL  | 000323 |
| .1    | 000324 |
| .2    | 000325 |
| .3    | 000326 |
| .4    | 000327 |
| .6    | 000330 |
| .7    | 000331 |
| .8    | 000332 |
| .9    | 000333 |
| .10   | 000334 |
| .12   | 000335 |
| .15   | 000336 |
| .23   | 000337 |
| .26   | 000340 |
| .27   | 000341 |
| .28   | 000342 |
| .30   | 000343 |
| .31   | 000344 |
| .32   | 000345 |
| .33   | 000346 |
| .34   | 000347 |
| .37   | 000350 |
| .40   | 000351 |
| .41   | 000352 |
| .43   | 000353 |
| .45   | 000354 |
| .46   | 000355 |
| .47   | 000356 |
| .48   | 000357 |
| .49   | 000360 |
| .58   | 000361 |
| .63   | 000362 |
| B100  | 000363 |
| E     | 000364 |
| F     | 000365 |
| .72   | 000366 |

|       |        |
|-------|--------|
| .74   | 000367 |
| .75   | 000370 |
| N     | 000371 |
| S     | 000372 |
| B133  | 000373 |
| B177  | 000374 |
| B200  | 000375 |
| MSK0  | 000376 |
| B400  | 000377 |
| B776  | 000400 |
| MSK1  | 000401 |
| B1000 | 000402 |
| B2000 | 000403 |
| B3000 | 000404 |
| SCCNT | 000405 |
| B4000 | 000406 |
| LF    | 000407 |
| B1400 | 000410 |
| UNMNC | 000411 |
| B2200 | 000412 |
| B2300 | 000413 |
| DEFOP | 000414 |
| REMOP | 000415 |
| RDOP  | 000416 |
| TENTH | 000417 |
| OPMSK | 000420 |
| MSK4  | 000421 |
| INF   | 000422 |
| TYPFL | 000423 |
| TABCN | 000424 |
| OPDMK | 000425 |
| RMODE | 000426 |
| UNNRM | 000427 |
| HIMSK | 000430 |
| M1    | 000431 |
| M2    | 000432 |
| M3    | 000433 |
| M4    | 000434 |
| M5    | 000435 |
| M6    | 000436 |
| M7    | 000437 |
| M8    | 000440 |
| M9    | 000441 |
| M10   | 000442 |
| M11   | 000443 |
| M15   | 000444 |
| M16   | 000445 |
| M21   | 000446 |
| M25   | 000447 |
| M32   | 000450 |
| D53   | 000451 |
| D72   | 000452 |
| D100  | 000453 |
| M72   | 000454 |
| M73   | 000455 |
| M76   | 000456 |

|       |        |
|-------|--------|
| D133  | 000457 |
| M256  | 000460 |
| M310  | 000461 |
| M1000 | 000462 |
| MAXSN | 000463 |
| MSK3  | 000437 |
| FN    | 000464 |
| QMARK | 000465 |
| HALF  | 000466 |
| HONE  | 000466 |
| MNEG  | 000470 |
| FLGBT | 000470 |
| MAXFX | 000472 |
| MINFX | 000474 |
| BLANK | 000476 |
| ERROR | 000477 |
| MVTOH | 000554 |
| MVTO1 | 000556 |
| CONST | 000567 |
| CONS1 | 000602 |
| CONS2 | 000605 |
| CONS3 | 000611 |
| SYE12 | 000614 |
| NUMCK | 000615 |
| NUMC1 | 000626 |
| NUMC2 | 000634 |
| NUMC3 | 000652 |
| NUMC4 | 000657 |
| NUMC5 | 000664 |
| NUMC6 | 000703 |
| NUMC7 | 000706 |
| NUMER | 000716 |
| NUMC8 | 000725 |
| NUMC9 | 000727 |
| NUM10 | 000751 |
| NUM12 | 000755 |
| NUM13 | 000772 |
| NUM14 | 000776 |
| NUM15 | 001005 |
| .PACK | 001020 |
| PACK1 | 001040 |
| PACK3 | 001073 |
| UNDER | 001074 |
| PACK4 | 001077 |
| OVRER | 001100 |
| OVFLW | 001103 |
| NORML | 001113 |
| NORM1 | 001125 |
| NORM2 | 001127 |
| NORM3 | 001130 |
| MBY10 | 001147 |
| DBY10 | 001200 |
| MPY   | 001236 |
| MPY1  | 001256 |
| MPY2  | 001271 |
| SYMCK | 001274 |

|       |        |
|-------|--------|
| SYMC1 | 001302 |
| SYMC2 | 001312 |
| FND88 | 001323 |
| FND81 | 001326 |
| CALER | 001330 |
| MDIM  | 001336 |
| MER9  | 001352 |
| SBFIX | 001353 |
| IFIX  | 001364 |
| IFIX1 | 001404 |
| IFIX2 | 001410 |
| IFIX3 | 001414 |
| ARINV | 001423 |
| ARIN1 | 001442 |
| ARIN2 | 001452 |
| .FLUN | 001456 |
| SLWST | 001467 |
| E1    | 001473 |
| BHSTP | 001476 |
| STTOP | 001505 |
| OPCHK | 001515 |
| E8    | 001526 |
| OPCH1 | 001527 |
| RSCHK | 001536 |
| DIGCK | 001570 |
| LETCK | 001603 |
| GETCR | 001614 |
| BCKSP | 001633 |
| ENOUT | 001643 |
| EDELM | 001656 |
| EDEL1 | 001660 |
| OUTLN | 001677 |
| OUTCR | 001715 |
| TEMP  | 000160 |
| TEMP1 | 000161 |
| TEMP2 | 000162 |
| TEMP3 | 000163 |
| TEMP4 | 000164 |
| COUNT | 000165 |
| STEMP | 000163 |
| MANT1 | 001274 |
| MANT2 | 001336 |
| EXPON | 001603 |
| DPFLG | 001633 |
| ARYAD | 001715 |
| EOL   | 000567 |
| FINBP | 001734 |
| RDYA  | 002000 |
| READY | 002001 |
| LFEED | 002004 |
| QMRKA | 002005 |
| STOPA | 002006 |
| CMNDA | 002007 |
| ENTRY | 002010 |
| FLUSH | 002020 |
| RDYPT | 002027 |

|        |        |
|--------|--------|
| PEXMK  | 002041 |
| DATAI  | 002046 |
| GTRCD  | 002056 |
| RPRCS  | 002064 |
| RTLE   | 002066 |
| REOUT  | 002115 |
| DRQST  | 002121 |
| CKRCD  | 002126 |
| INVSC  | 002137 |
| CMNDS  | 002146 |
| RUN    | 002146 |
| SCRTH  | 002150 |
| TLIST  | 002151 |
| PLIST  | 002153 |
| PTAPE  | 002160 |
| PRERR  | 002170 |
| EOTR   | 002174 |
| STOP   | 002200 |
| TAPE   | 002214 |
| BYEC   | 002216 |
| SYNTAX | 002220 |
| SYNE1  | 002236 |
| SYNT1  | 002247 |
| QUOTE  | 002257 |
| COMMA  | 002261 |
| SMCLN  | 002263 |
| RPARN  | 002265 |
| RBRAC  | 002267 |
| SCMMA  | 002271 |
| ASSOP  | 002273 |
| PLUS   | 002275 |
| MINUS  | 002277 |
| TIMES  | 002301 |
| DIV    | 002303 |
| EXPS   | 002305 |
| GTR    | 002307 |
| LSS    | 002311 |
| UNEQL  | 002313 |
| EQUAL  | 002315 |
| UNMIN  | 002317 |
| LBRAC  | 002321 |
| LPARN  | 002323 |
| UPLUS  | 002325 |
| OROP   | 002327 |
| MSFLG  | 002330 |
| ANDOP  | 002331 |
| DFLAG  | 002332 |
| NOTOP  | 002333 |
| PFLAG  | 002334 |
| GTREQ  | 002335 |
| UFLAG  | 002336 |
| LSSEQ  | 002337 |
| LETS   | 002340 |
| SYNE2  | 002346 |
| EOST   | 002346 |
| DIMS   | 002351 |

|       |        |
|-------|--------|
| COMS  | 002355 |
| SYNE3 | 002361 |
| COMS1 | 002363 |
| DEFS  | 002374 |
| SYNE4 | 002405 |
| SYNE5 | 002420 |
| SYNE6 | 002424 |
| REMS  | 002434 |
| IFS   | 002437 |
| SYNE7 | 002445 |
| GOTO8 | 002445 |
| FOR8  | 002450 |
| SYNE8 | 002452 |
| SYNE9 | 002465 |
| SYE10 | 002500 |
| NXT6  | 002502 |
| END8  | 002506 |
| WAITS | 002512 |
| CALL9 | 002514 |
| CALL2 | 002532 |
| SYE11 | 002540 |
| CALL3 | 002543 |
| DATA8 | 002547 |
| READS | 002557 |
| SYE13 | 002561 |
| PRIN1 | 002573 |
| PRINS | 002577 |
| PRIN2 | 002604 |
| SYE14 | 002613 |
| PRIN3 | 002623 |
| SYE15 | 002625 |
| PRIN4 | 002647 |
| PRIN5 | 002651 |
| MATS  | 002654 |
| SYE16 | 002656 |
| SYE17 | 002671 |
| MATS0 | 002673 |
| SYE18 | 002702 |
| MATS1 | 002710 |
| MATS2 | 002722 |
| SYE19 | 002755 |
| SYE20 | 002775 |
| MATS3 | 002776 |
| SYE21 | 003007 |
| MATS4 | 003010 |
| SYE22 | 003020 |
| MATS5 | 003024 |
| SYE23 | 003041 |
| MATS6 | 003045 |
| SYE24 | 003057 |
| MATS7 | 003061 |
| SYNTB | 003067 |
| FSC   | 003114 |
| FSC1  | 003117 |
| FSC2  | 003121 |
| FSC3  | 003146 |

|       |        |
|-------|--------|
| FSC4  | 003162 |
| FSC5  | 003170 |
| FSCE1 | 003201 |
| FSC7  | 003210 |
| FSC6  | 003227 |
| FSC8  | 003253 |
| FSCE2 | 003255 |
| FSC9  | 003261 |
| FSC10 | 003271 |
| FSC11 | 003275 |
| FSC12 | 003301 |
| FSC13 | 003304 |
| FSCE3 | 003305 |
| FSC14 | 003317 |
| MCBCK | 003322 |
| FPOP  | 003330 |
| FRCUR | 003353 |
| SSOV  | 003371 |
| FSCE4 | 003401 |
| SBSC1 | 003403 |
| SBSC2 | 003436 |
| SBSC3 | 003450 |
| SBSC4 | 003473 |
| ARRYS | 003530 |
| ARRE1 | 003534 |
| ARRID | 003544 |
| ARRE2 | 003547 |
| VAROP | 003556 |
| VAR01 | 003600 |
| VAR02 | 003604 |
| VAR03 | 003616 |
| VAR04 | 003620 |
| VAR05 | 003624 |
| LTR   | 003635 |
| STROP | 003650 |
| LPCK  | 003661 |
| RPCK  | 003671 |
| MATSB | 003704 |
| GETPF | 003734 |
| NUMOP | 003744 |
| SYCMD | 003755 |
| STCMD | 003776 |
| LET   | 004006 |
| DIM   | 004011 |
| COM   | 004014 |
| DEF   | 004017 |
| REM   | 004022 |
| GOTO  | 004025 |
| IF    | 004030 |
| FUR   | 004032 |
| NEXT  | 004035 |
| GUSUB | 004040 |
| RTRN  | 004044 |
| END   | 004050 |
| STP   | 004053 |
| WAIT  | 004056 |

|       |        |
|-------|--------|
| CALL  | 004061 |
| DATA  | 004064 |
| READ  | 004067 |
| PRINT | 004072 |
| INPUT | 004076 |
| RSTOR | 004102 |
| MAT   | 004107 |
| THEN  | 004112 |
| TO    | 004115 |
| STEP  | 004117 |
| NOT   | 004122 |
| AND   | 004125 |
| OR    | 004130 |
| GTE   | 004132 |
| LTE   | 004134 |
| AUNEQ | 004136 |
| TAB   | 004140 |
| SIN   | 004143 |
| COS   | 004146 |
| TAN   | 004151 |
| ATN   | 004154 |
| EXPN  | 004157 |
| LOG   | 004162 |
| ABS   | 004165 |
| SQR   | 004170 |
| INT   | 004173 |
| RND   | 004176 |
| SGN   | 004201 |
| ZER   | 004204 |
| CON   | 004207 |
| IDN   | 004212 |
| INV   | 004215 |
| TRN   | 004220 |
| TBSRH | 004223 |
| TSRC1 | 004246 |
| TSRC2 | 004262 |
| TSR10 | 004265 |
| TSRC3 | 004271 |
| TSRC4 | 004276 |
| TSRC5 | 004304 |
| TSRC6 | 004310 |
| TSRC7 | 004313 |
| TSRC8 | 004321 |
| TSRC9 | 004326 |
| PRGIN | 004333 |
| 8YE25 | 004344 |
| PRGI1 | 004346 |
| INTCK | 004351 |
| INTC1 | 004354 |
| INTC2 | 004373 |
| CHRST | 004410 |
| CHRS1 | 004414 |
| CHRS2 | 004432 |
| CHRS3 | 004433 |
| DLSTM | 004437 |
| ACTST | 004447 |



|        |        |
|--------|--------|
| ACCS1  | 004472 |
| ACCS2  | 004474 |
| ACCS3  | 004477 |
| ACCS4  | 004507 |
| FNDP8  | 004513 |
| FNDP1  | 004516 |
| FNDP2  | 004533 |
| FNDP3  | 004534 |
| FNDP4  | 004535 |
| CLPRG  | 004537 |
| CLPR1  | 004544 |
| CLPR2  | 004553 |
| OVCHK  | 004556 |
| LIST   | 004572 |
| LIST0  | 004607 |
| LIST1  | 004614 |
| LIST3  | 004635 |
| LIST2  | 004640 |
| LIST4  | 004644 |
| LIST5  | 004670 |
| LIST6  | 004703 |
| LIST7  | 004710 |
| LIST8  | 004725 |
| LIST9  | 004732 |
| LIST10 | 004751 |
| LIST11 | 004765 |
| LIST12 | 004772 |
| LIST13 | 005003 |
| LIST14 | 005011 |
| OUTIN  | 005015 |
| OUTI1  | 005024 |
| OUTI2  | 005043 |
| OUTI3  | 005046 |
| OUTST  | 005055 |
| OUTS1  | 005056 |
| MCOUT  | 005077 |
| MCOU1  | 005100 |
| MCOU2  | 005112 |
| MCOU3  | 005120 |
| LDVSR  | 005132 |
| SFLAG  | 003530 |
| TABLE  | 004333 |
| LNETH  | 000167 |
| SMEND  | 004351 |
| SENG   | 004556 |
| TBLPT  | 004513 |
| TSPTH  | 004537 |
| INTGR  | 004556 |
| LFLAG  | 004333 |
| DIVSR  | 004351 |
| LDZRO  | 004556 |
| MIND   | 004513 |
| MFASE  | 005137 |
| MLOP1  | 005151 |
| MLO10  | 005161 |
| MLO12  | 005176 |

|       |        |
|-------|--------|
| MLO13 | 005202 |
| MLOP2 | 005211 |
| MLOP3 | 005244 |
| MLOP4 | 005261 |
| MER3  | 005264 |
| MLOP5 | 005272 |
| MLOP6 | 005301 |
| MER4  | 005312 |
| MLOP7 | 005320 |
| MLOP8 | 005335 |
| MLOP8 | 005370 |
| MLOP9 | 005373 |
| MER5  | 005377 |
| M1LOP | 005407 |
| MER6  | 005413 |
| M2LOP | 005414 |
| MER10 | 005431 |
| M3LOP | 005445 |
| MER7  | 005464 |
| M4LOP | 005466 |
| STDIM | 005500 |
| ESYMT | 005501 |
| MER8  | 005512 |
| MSYMT | 005522 |
| MSYM  | 005541 |
| MBUF  | 005543 |
| MBOX1 | 000157 |
| MBIN1 | 001467 |
| MBIN2 | 001536 |
| MPTR  | 000135 |
| MNPTR | 001515 |
| COML  | 000170 |
| MWDNO | 000171 |
| DIGCT | 005522 |
| FORMX | 005544 |
| FORM1 | 005547 |
| FORM2 | 005567 |
| FORM0 | 005612 |
| FOR11 | 005617 |
| FOR10 | 005626 |
| FORM4 | 005636 |
| FORM5 | 005645 |
| FORM6 | 005651 |
| FOR12 | 005714 |
| FORM7 | 005726 |
| FORM9 | 005751 |
| XECTB | 005761 |
| XEC   | 006006 |
| XEC2  | 006025 |
| XEC4  | 006044 |
| XEC5  | 006054 |
| XEC6  | 006055 |
| FETCH | 006064 |
| SETDP | 006074 |
| STSRH | 006105 |
| STSR1 | 006110 |

|       |        |
|-------|--------|
| STSR2 | 006124 |
| FDATA | 006126 |
| FDAT1 | 006127 |
| E4    | 006135 |
| FDAT2 | 006137 |
| FLWST | 006147 |
| FVSRH | 006163 |
| FVSR1 | 006173 |
| FVSR2 | 006201 |
| ELET  | 006203 |
| EGOTO | 006205 |
| EIF   | 006210 |
| EFOR  | 006216 |
| EFOR1 | 006230 |
| EFOR2 | 006263 |
| EFOR3 | 006274 |
| ENEXT | 006312 |
| ENEX1 | 006333 |
| ENEX2 | 006340 |
| ENEX3 | 006347 |
| EGOSB | 006353 |
| E2    | 006363 |
| ERTRN | 006364 |
| E3    | 006367 |
| EWAIT | 006373 |
| EWAI1 | 006404 |
| ECALL | 006412 |
| ECAL1 | 006423 |
| ECAL2 | 006431 |
| ERead | 006441 |
| PRNIN | 006456 |
| EPRIN | 006474 |
| EPRI0 | 006477 |
| EPRI1 | 006502 |
| EPRI2 | 006510 |
| EPRI3 | 006527 |
| EPRI4 | 006536 |
| EPRI5 | 006542 |
| EPRI6 | 006556 |
| EPRI7 | 006565 |
| EPRI8 | 006603 |
| ETAB  | 006605 |
| ETAB1 | 006627 |
| IENTA | 006631 |
| EINP1 | 006632 |
| EINP2 | 006634 |
| EINPT | 006643 |
| EINP3 | 006652 |
| ERSTR | 006656 |
| AROTB | 006663 |
| BINOP | 006707 |
| BINO1 | 006717 |
| BINO2 | 006720 |
| ESCHA | 006722 |
| ESCM1 | 006747 |
| E6    | 006760 |

|       |        |
|-------|--------|
| ESBS  | 006771 |
| ESTR  | 007002 |
| ESTR1 | 007007 |
| ESTR2 | 007022 |
| EFAD  | 007026 |
| EF8B  | 007031 |
| EFMP  | 007034 |
| EFDV  | 007037 |
| EPWR  | 007042 |
| RPWR  | 007054 |
| BASER | 007057 |
| EPWR1 | 007065 |
| IPWR  | 007073 |
| IPWR1 | 007103 |
| IPWR2 | 007107 |
| IPWR5 | 007117 |
| IPWR3 | 007124 |
| IPWR4 | 007135 |
| PCHK  | 007144 |
| POWER | 007153 |
| ZRTNG | 007156 |
| PCHK1 | 007161 |
| EGTRT | 007164 |
| ELST  | 007171 |
| EEQL  | 007176 |
| EEQL1 | 007200 |
| EGORE | 007203 |
| ELORE | 007210 |
| ENEQL | 007215 |
| ENEQ1 | 007217 |
| FALSE | 007221 |
| TRUE  | 007224 |
| EUMIN | 007227 |
| ELBRC | 007232 |
| EOR   | 007240 |
| ORS   | 007242 |
| OK81  | 007244 |
| EAND  | 007246 |
| ANDS  | 007250 |
| ENOT  | 007253 |
| ADMUP | 007257 |
| ADMU1 | 007261 |
| ADMU2 | 007302 |
| ADMU3 | 007313 |
| ADMU4 | 007334 |
| ADMU5 | 007337 |
| .FAD  | 007343 |
| .F8B  | 007347 |
| .F8B1 | 007362 |
| UNPAK | 007366 |
| .FMP  | 007416 |
| .FDV  | 007463 |
| .FDV1 | 007543 |
| .FDV2 | 007546 |
| DBYZR | 007547 |
| IDIV  | 007552 |

|       |        |
|-------|--------|
| IDIV1 | 007577 |
| IDIV2 | 007601 |
| SSYMT | 007620 |
| SYMT1 | 007640 |
| SYMT2 | 007647 |
| SYMT4 | 007667 |
| SYMT3 | 007674 |
| ERR   | 007701 |
| RCERR | 010001 |
| EBUFF | 010007 |
| EBFF  | 010013 |
| LBUFF | 010015 |
| LNBBF | 010022 |
| PDFT  | 010024 |
| NUM07 | 010040 |
| NS1   | 010052 |
| NS2   | 010055 |
| NUM01 | 010101 |
| NUM02 | 010110 |
| NUM05 | 010127 |
| NUM03 | 010135 |
| EOUT2 | 010153 |
| EOUT3 | 010164 |
| EOUT4 | 010175 |
| EOUT6 | 010213 |
| EOUT5 | 010217 |
| EOUT7 | 010223 |
| EOUT8 | 010227 |
| ERND1 | 010242 |
| ERND2 | 010262 |
| ERND3 | 010276 |
| EOUT1 | 010303 |
| EOUT9 | 010333 |
| EOU10 | 010340 |
| GETDG | 010344 |
| RETCR | 010370 |
| A1    | 006074 |
| A2    | 006105 |
| C1    | 006147 |
| C2    | 006163 |
| ETAN  | 010406 |
| TRGER | 010420 |
| BOTH1 | 010441 |
| ELSE1 | 010467 |
| ELSE2 | 010472 |
| FOP1  | 010475 |
| K1    | 010477 |
| XTEMP | 010501 |
| YTEMP | 010503 |
| UTEMP | 010505 |
| K2    | 010507 |
| COEFF | 010511 |
| EATN  | 010532 |
| BTH1  | 010546 |
| ELS1  | 010576 |
| ELS2  | 010601 |

|        |        |
|--------|--------|
| EL83   | 010604 |
| PIBY2  | 010611 |
| MP2    | 010613 |
| COEF   | 010615 |
| EABS   | 010642 |
| ECOS   | 010645 |
| ESIN   | 010647 |
| PAST   | 010702 |
| TOP1   | 010717 |
| MM4    | 010721 |
| COEF1  | 010723 |
| ERND   | 010736 |
| ESQR   | 010765 |
| SQRER  | 010771 |
| BTH2   | 011005 |
| SBOX   | 011032 |
| ODD    | 011034 |
| SA1    | 011045 |
| SA2    | 011047 |
| SB1    | 011051 |
| SB2    | 011053 |
| EINT   | 011055 |
| EINT1  | 011065 |
| ELOG   | 011070 |
| .LOG   | 011072 |
| LOGGER | 011077 |
| .LOG1  | 011150 |
| LNZR   | 011151 |
| R22    | 011154 |
| LE2    | 011156 |
| AAA    | 011160 |
| MB     | 011162 |
| CCC    | 011164 |
| ESGN   | 011166 |
| EEXP   | 011177 |
| .EXP   | 011201 |
| INTE   | 011274 |
| ZERE   | 011276 |
| .EXP1  | 011301 |
| EXPER  | 011305 |
| M124   | 011310 |
| .244   | 011311 |
| AAAA   | 011312 |
| BBBB   | 011314 |
| CCCC   | 011316 |
| DDDD   | 011320 |
| L2E    | 011322 |
| .CHEB  | 011324 |
| LOPC   | 011343 |
| COUT   | 011371 |
| X2TMP  | 011401 |
| ATMP   | 011403 |
| BTMP   | 011405 |
| CTMP   | 011407 |
| DTMP   | 011411 |
| .IENT  | 011413 |

|       |        |
|-------|--------|
| FLOAT | 011432 |
| .PWR2 | 011440 |
| .RET  | 011454 |
| TT1   | 007463 |
| TT2   | 007552 |
| TT3   | 008163 |
| TT4   | 008164 |
| FFLAG | 011032 |
| EMAT  | 011456 |
| EMAT1 | 011471 |
| EMAT2 | 011535 |
| EMAT3 | 011540 |
| EMAT4 | 011555 |
| EMAT5 | 011561 |
| EMAT6 | 011600 |
| EMAT7 | 011610 |
| EMAT8 | 011622 |
| EMAT8 | 011626 |
| EMAT9 | 011662 |
| LHAP  | 011666 |
| LBASE | 011667 |
| EMA10 | 011701 |
| EMA11 | 011711 |
| EMA12 | 011725 |
| REDIM | 011732 |
| REDI1 | 011746 |
| E7    | 011766 |
| MCK3  | 011767 |
| GENER | 012000 |
| GEN2  | 012004 |
| LOOP  | 012013 |
| MOD1  | 012017 |
| MOD2  | 012025 |
| COMPR | 012032 |
| LERR  | 012035 |
| LCHK2 | 012045 |
| LCHK1 | 012051 |
| LCHK4 | 012061 |
| LCHK6 | 012067 |
| LCHK5 | 012100 |
| ADD   | 012103 |
| ADD1  | 012105 |
| SUB   | 012116 |
| REPLC | 012123 |
| REPL1 | 012130 |
| SMULT | 012137 |
| LCON  | 012145 |
| LCON1 | 012150 |
| LCON2 | 012161 |
| SZER  | 012170 |
| LIDN  | 012176 |
| LIDN1 | 012216 |
| .OLD  | 012230 |
| .DST  | 012240 |
| GETAD | 012250 |
| GET   | 012253 |

|               |        |
|---------------|--------|
| ADRES         | 012264 |
| TINY          | 012265 |
| TRAN          | 012266 |
| TRAN1         | 012302 |
| LNEXT         | 012304 |
| MULT          | 012331 |
| MULT4         | 012361 |
| MULT3         | 012366 |
| MULT2         | 012374 |
| LINV          | 012441 |
| LIN11         | 012502 |
| LIN10         | 012522 |
| LINV1         | 012535 |
| LINV2         | 012551 |
| LINV7         | 012571 |
| LINV8         | 012602 |
| LINV3         | 012626 |
| LDUM1         | 012704 |
| LINV6         | 012716 |
| LIN12         | 012733 |
| LIN13         | 012740 |
| LIN14         | 012752 |
| LINV4         | 012760 |
| LINV5         | 013006 |
| LIN15         | 013033 |
| LIN18         | 013040 |
| LIN17         | 013062 |
| LWHR          | 013067 |
| LWHR2         | 013101 |
| T1            | 013113 |
| T2            | 013114 |
| T3            | 013115 |
| T4            | 013116 |
| T5            | 013117 |
| T6            | 013120 |
| T7            | 013121 |
| T8            | 013122 |
| T9            | 013123 |
| T10           | 013124 |
| T11           | 013125 |
| T12           | 013126 |
| T13           | 013127 |
| T16           | 013130 |
| T18           | 013132 |
| T19           | 013133 |
| LPIV          | 013134 |
| LPLUS         | 013135 |
| LMIN          | 013137 |
| LTIME         | 013140 |
| INCB2         | 013141 |
| FINIS         | 013142 |
| ** NO ERRORS* |        |



BASE PAGE LINKS AND CONSTANTS

BASE PAGE SUBROUTINES

PAGE 0019 #01 BASE PAGE LINKS AND CONSTANTS

|        |                                  |                                     |                                   |
|--------|----------------------------------|-------------------------------------|-----------------------------------|
| 0001   |                                  | ASMB,A,B,L,T                        | BASIC LANGUAGE -- JANUARY 1, 1970 |
| 0003   | 00077                            | ORG 77B                             |                                   |
| 0004   |                                  | SUP PRESS MULTIPLE OPERAND PRINTING |                                   |
| 0005   | 00077 102077                     | HLT 77B                             | CHANGED TO JSB 107B,I BY 'BOSS'   |
| 0006*  |                                  |                                     |                                   |
| 0007** | ENTRY POINT FOR CONFIGURED BASIC |                                     |                                   |
| 0008*  |                                  |                                     |                                   |
| 0009   | 00100 124201                     | JMP START,I                         |                                   |
| 0010*  |                                  |                                     |                                   |
| 0011   | 00101 000000                     | PREAD BSS 1                         | PHOTO READER LINK                 |
| 0012   | 00102 000000                     | WRITE BSS 1                         | TTY OUTPUT LINK                   |
| 0013   | 00103 000000                     | PUNCH BSS 1                         | PUNCH LINK                        |
| 0014   | 00104 000000                     | REED BSS 1                          | KEYBOARD LINK                     |
| 0015   | 00105 002200                     | DEF STOP                            | STOP LINK                         |
| 0016   | 00106 000000                     | LWEM BSS 1                          | LAST WORD OF AVAILABLE MEMORY     |
| 0017   | 00107 000000                     | BSS 1                               | 'BOSS' DRIVER LINKAGE             |
| 0018   | 00110 013142                     | FWAM DEF FINIS                      | FIRST WORD OF AVAILABLE MEMORY    |
| 0019   | 00111 000000                     | LWAM BSS 1                          | LAST WORD OF AVAILABLE MEMORY     |
| 0020   | 00112 000000                     | PBUFF BSS 1                         | FIRST WORD OF USERS PROGRAM       |
| 0021   | 00113 000000                     | PBPTR BSS 1                         | LAST WORD+1 OF USER'S PROGRAM     |
| 0022   | 00114 001734                     | FWABP DEF FINBP                     | FIRST WORD AVAILABLE BASE PAGE    |
| 0023   | 00115 000000                     | FCORE BSS 1                         | START OF FREE CORE                |
| 0024   | 00116 000000                     | SYMTF BSS 1                         | START OF SYMBOL TABLE             |
| 0025   | 00117 000000                     | SYMTA BSS 1                         | SYMBOL TABLE END                  |
| 0026   | 00120 000000                     | LSTAK BSS 1                         | LOW-CORE STACK ADDRESS            |
| 0027   | 00121 013142                     | ASBTB DEF FINIS                     | START OF CALL LINKAGE TABLE       |
| 0028   | 00122 013142                     | SBTBE DEF FINIS                     | LAST WORD +1 OF CALL TABLE        |
| 0029   | 00123 000000                     | IMOFF BSS 1                         | LINK TO INTERRUPT OFF             |
| 0030   | 00124 000000                     | IMCN BSS 1                          | LINK TO INTERRUPT ON              |
| 0031   | 00125 000000                     | TLINK BSS 1                         | TTY INTERRUPT LINK                |
| 0032   | 00126 100103                     | PLSTR DEF PUNCH,I                   |                                   |
| 0033   | 00127 100102                     | LISTR DEF WRITE,I                   | LIST DEVICE REFERENCE JSB,I       |
| 0034   | 00130 100102                     | TLSTR DEF WRITE,I                   |                                   |
| 0035   | 00131 000000                     | .BLFA BSS 1                         | I/O BUFFER ADDRESS                |
| 0036   | 00132 000000                     | BACDR BSS 1                         | I/O BUFFER                        |
| 0037   | 00133 000000                     | CCNT BSS 1                          | POINTERS                          |
| 0038   | 00134 000000                     | SBLFA BSS 1                         | SYNTAX BUFFER ADDRESS             |
| 0039   | 00135 000000                     | SBPTR BSS 1                         | SYNTAX BUFFER POINTER             |
| 0040   | 00136 000000                     | TFLAG BSS 1                         |                                   |
| 0041   | 00137 000000                     | TTYFL BSS 1                         |                                   |
| 0042   | 00140 000000                     | TSIPT BSS 1                         | TEMPORARY STACK POINTER           |
| 0043   | 00141 000000                     | LSTPT BSS 1                         | LOW-CORE STACK POINTER            |
| 0044   | 00142 000000                     | HSTPT BSS 1                         | HIGH-CORE STACK POINTER           |
| 0045   | 00143 000000                     | PRADD BSS 1                         | PROGRAM EXECUTION                 |
| 0046   | 00144 000000                     | NXTST BSS 1                         | SEQUENCING INFORMATION            |
| 0047   | 00145 000000                     | .LNUM BSS 1                         | CURRENT LINE NUMBER               |
| 0048   | 00146 000000                     | TYPE BSS 1                          | CURRENT STATEMENT TYPE            |
| 0049   | 00147 000000                     | DSTRT BSS 1                         | DATA                              |
| 0050   | 00150 000000                     | NXTDT BSS 1                         | STATEMENT                         |
| 0051   | 00151 000000                     | DCCNT BSS 1                         | POINTERS                          |
| 0052   | 00152 000000                     | RSYM BSS 1                          |                                   |
| 0053   | 00153 000000                     | SIGN BSS 1                          |                                   |
| 0054   | 00154 000000                     | EXP BSS 1                           |                                   |
| 0055   | 00155 000000                     | XH BSS 1                            | RANDOM                            |
| 0056   | 00156 000000                     | XL BSS 1                            | VARIABLE                          |
| 0057   | 00157 000000                     | TEMPS BSS 12                        | TEMPORARIES                       |

PAGE 0020 #01 BASE PAGE LINKS AND CONSTANTS

|      |       |        |       |     |          |
|------|-------|--------|-------|-----|----------|
| 0058 | 00171 |        | MLBX1 | EQU | TEMPS+10 |
| 0059 | 00173 | 000000 | B1    | BSS | 2        |
| 0060 | 00175 | 000000 | B2    | BSS | 2        |
| 0061 | 00177 | 000000 | B3    | BSS | 2        |

PAGE 0021 #01 BASE PAGE LINKS AND CONSTANTS

|      |       |        |       |     |         |                                  |
|------|-------|--------|-------|-----|---------|----------------------------------|
| 0063 | 00201 | 002010 | START | DEF | ENTRY   | INITIATE BASIC SYSTEM            |
| 0064 | 00202 | 005137 | RUNA  | DEF | MFASE   | PHASE 2: BUILD SYMBOL TABLE      |
| 0065 | 00203 | 006006 | FASE3 | DEF | XEC     | PHASE 3: PROGRAM EXECUTION       |
| 0066 | 00204 | 002041 | PEXMA | DEF | PEXMK   | RETURN TO MONITOR FROM SYNTAX    |
| 0067 | 00205 | 002027 | RDYDA | DEF | RDYPT   | RETURN TO MONITOR FROM PHASE 3   |
| 0068 | 00206 | 002121 | DRGSA | DEF | DRQST   | REQUEST INPUT DATA               |
| 0069 | 00207 | 004572 | LISTA | DEF | LIST    | LIST OR PUNCH PROGRAM            |
| 0070 | 00210 | 004110 | *MATA | DEF | MAT+1   | MAT ENTRY IN PRINT-NAME TABLE    |
| 0071 | 00211 | 011456 | EMATA | DEF | EMAT    | FIRST WORD OF MATRIX EXECUTION   |
| 0072 | 00212 | 004223 | TSRCH | DEF | TBSRH   | SEARCH PRINT-NAME TABLE          |
| 0073 | 00213 | 004513 | FNDPA | DEF | FNDPS   | LOCATE STATEMENT SPECIFIED BY #  |
| 0074 | 00214 | 000567 | CNSTA | DEF | CONST   | SIGNED ASCII TO BINARY           |
| 0075 | 00215 | 000615 | NUMCA | DEF | NUMCK   | UNSIGNED ASCII TO BINARY         |
| 0076 | 00216 | 004351 | INCHK | DEF | INTCK   | ASCII TO INTEGER CONVERSION      |
| 0077 | 00217 | 001643 | ENCTA | DEF | ENOUT   | SIGNED BINARY NUMBER TO ASCII    |
| 0078 | 00220 | 010040 | NUMOA | DEF | NUMOT   | UNSIGNED BINARY NUMBER TO ASCII  |
| 0079 | 00221 | 004333 | PGINT | DEF | PRGIN   | FETCH PROGRAM INTEGER            |
| 0080 | 00222 | 005015 | OUTIA | DEF | OUTIN   | INTEGER TO ASCII CONVERSION      |
| 0081 | 00223 | 005055 | OUTSA | DEF | OUTST   | STRING TO BUFFER                 |
| 0082 | 00224 | 001677 | OUTLA | DEF | OUTLN   | DUMP PRINT BUFFER WITH CR/LF     |
| 0083 | 00225 | 001715 | OUTCA | DEF | OUTCR   | PUT CHARACTER INTO PRINT BUFFER  |
| 0084 | 00226 | 001614 | GETCA | DEF | GETCR   | FETCH NEXT NON-BLANK CHARACTER   |
| 0085 | 00227 | 001570 | DIGCA | DEF | DIGCK   | SEE IF CHARACTER IS A DIGIT      |
| 0086 | 00230 | 001603 | LETCA | DEF | LETCK   | SEE IF CHARACTER IS A LETTER     |
| 0087 | 00231 | 007620 | SSYMA | DEF | SSYMT   | SEARCH SYMBOL TABLE FOR SYMBOL   |
| 0088 | 00232 | 006064 | FETCA | DEF | FETCH   | EVALUATE FORMULA & RETURN VALUE  |
| 0089 | 00233 | 005544 | FORMA | DEF | FORMX   | EVALUATE FORMULA                 |
| 0090 | 00234 | 011072 | .LCGA | DEF | .LOG    | TAKE NATURAL LOG OF ARGUMENT     |
| 0091 | 00235 | 011201 | .EXPA | DEF | .EXP    | COMPUTE EXPONENTIAL OF ARGUMENT  |
| 0092 | 00236 | 007343 | .FADA | DEF | .FAD    | FLOATING ADD                     |
| 0093 | 00237 | 007347 | .FSBA | DEF | .FSB    | FLOATING SUBTRACT                |
| 0094 | 00240 | 007416 | .FMPA | DEF | .FMP    | FLOATING MULTIPLY                |
| 0095 | 00241 | 007463 | .FDVA | DEF | .FDV    | FLOATING DIVIDE                  |
| 0096 | 00242 | 001423 | ARINA | DEF | ARINV   | NEGATE FLOATING NUMBER           |
| 0097 | 00243 | 001236 | MPYA  | DEF | MPY     | INTEGER MULTIPLY                 |
| 0098 | 00244 | 001456 | FLLNA | DEF | .FLUN   | UNPACK FLOATING NUMBER           |
| 0099 | 00245 | 001020 | PACKA | DEF | .PACK   | PACK FLOATING NUMBER             |
| 0100 | 00246 | 011432 | FLT   | DEF | FLOAT   | 16-BIT INTEGER TO FLOATING       |
| 0101 | 00247 | 001364 | IFIXA | DEF | IFIX    | FLOATING TO INTEGER (TRUNCATION) |
| 0102 | 00250 | 006456 | PRNIA | DEF | PRNIN   | INITIALIZE PRINT BUFFER          |
| 0103 | 00251 | 004410 | CHRSA | DEF | CHRST   |                                  |
| 0104 | 00252 | 004447 | ACCST | DEF | ACTST   |                                  |
| 0105 | 00253 | 004437 | DELST | DEF | DLSTM   |                                  |
| 0106 | 00254 | 006126 | FDAT  | DEF | FDATA   |                                  |
| 0107 | 00255 | 012045 | LCK2A | DEF | LCHK2   |                                  |
| 0108 | 00256 | 006044 | XEC4A | DEF | XEC4    |                                  |
| 0109 | 00257 | 003317 | FSC1A | DEF | FSC14   |                                  |
| 0110 | 00260 | 005547 | FOR1A | DEF | FORM1   |                                  |
| 0111 | 00261 | 005612 | FOR0A | DEF | FORM0   |                                  |
| 0112 | 00262 | 005617 | FOR0B | DEF | FOR11   |                                  |
| 0113 | 00263 | 005626 | FOR1B | DEF | FOR10   |                                  |
| 0114 | 00264 | 005714 | FR12A | DEF | FOR12   |                                  |
| 0115 | 00265 | 014477 | EOF   | JSB | ERROR   |                                  |
| 0116 | 00266 | 014477 | NOEOF | JSB | ERROR   |                                  |
| 0117 | 00267 | 001525 | E8M1A | DEF | E8-1    |                                  |
| 0118 | 00270 | 002360 | ESYN3 | DEF | SYNE3-1 |                                  |

PAGE 0022 #01 BASE PAGE LINKS AND CONSTANTS

|      |       |        |         |     |            |
|------|-------|--------|---------|-----|------------|
| 0119 | 00271 | 003401 | FSCEF   | DEF | FSCE4      |
| 0120 | 00272 | 006757 | E6+1A   | DEF | E6-1       |
| 0121 | 00273 | 010007 | EBLFA   | DEF | EBUFF      |
| 0122 | 00274 | 010012 | EBFA    | DEF | EBFF-1     |
| 0123 | 00275 | 010015 | LBUFA   | DEF | LBUFF      |
| 0124 | 00276 | 010021 | LNBFA   | DEF | LNBFF-1    |
| 0125 | 00277 | 007700 | ERBS    | DEF | ERR-1      |
| 0126 | 00300 | 000100 | RECER   | DEF | RCERR-ERR  |
| 0127 | 00301 | 002255 | FOPBS   | DEF | QUOTE-2    |
| 0128 | 00302 | 103035 | STBAS   | DEF | SYNTB-26,1 |
| 0129 | 00303 | 105727 | XECBR   | DEF | XECTB-26,1 |
| 0130 | 00304 | 106655 | ARBAS   | DEF | AROTB-6,1  |
| 0131 | 00305 | 010023 | PDFBS   | DEF | PDFT-1     |
| 0132 | 00306 | 003755 | TBLAD   | DEF | SYCMD      |
| 0133 | 00307 | 004006 | STTYP   | DEF | LET        |
| 0134 | 00310 | 004067 | MATIO   | DEF | READ       |
| 0135 | 00311 | 004125 | MCBOP   | DEF | AND        |
| 0136 | 00312 | 004143 | PDFNS   | DEF | SIN        |
| 0137 | 00313 | 004204 | X MATFN | DEF | ZER        |
| 0138 | 00314 | 004035 | ANEXT   | DEF | NEXT       |
| 0139 | 00315 | 004064 | ADATA   | DEF | DATA       |
| 0140 | 00316 | 004112 | ATHEN   | DEF | THEN       |
| 0141 | 00317 | 004115 | ATC     | DEF | TO         |
| 0142 | 00320 | 004117 | ASTEP   | DEF | STEP       |
| 0143 | 00321 | 004122 | ANCT    | DEF | NOT        |
| 0144 | 00322 | 004140 | ATAB    | DEF | TAB        |
| 0145 | 00323 | 000171 | MBXL    | DEF | MLBX1      |

PAGE 0023 #01 BASE PAGE LINKS AND CONSTANTS

|      |       |        |       |           |
|------|-------|--------|-------|-----------|
| 0147 | 00324 | 000001 | .1    | DEC 1     |
| 0148 | 00325 | 000002 | .2    | DEC 2     |
| 0149 | 00326 | 000003 | .3    | DEC 3     |
| 0150 | 00327 | 000004 | .4    | DEC 4     |
| 0151 | 00330 | 000006 | .6    | DEC 6     |
| 0152 | 00331 | 000007 | .7    | DEC 7     |
| 0153 | 00332 | 000010 | .8    | DEC 8     |
| 0154 | 00333 | 000011 | .9    | DEC 9     |
| 0155 | 00334 | 000012 | .10   | DEC 10    |
| 0156 | 00335 | 000014 | .12   | DEC 12    |
| 0157 | 00336 | 000017 | .15   | DEC 15    |
| 0158 | 00337 | 000027 | .23   | DEC 23    |
| 0159 | 00340 | 000032 | .26   | DEC 26    |
| 0160 | 00341 | 000033 | .27   | DEC 27    |
| 0161 | 00342 | 000034 | .28   | DEC 28    |
| 0162 | 00343 | 000036 | .30   | DEC 30    |
| 0163 | 00344 | 000037 | .31   | DEC 31    |
| 0164 | 00345 | 000040 | .32   | DEC 32    |
| 0165 | 00346 | 000041 | .33   | DEC 33    |
| 0166 | 00347 | 000042 | .34   | DEC 34    |
| 0167 | 00350 | 000045 | .37   | DEC 37    |
| 0168 | 00351 | 000050 | .40   | DEC 40    |
| 0169 | 00352 | 000051 | .41   | DEC 41    |
| 0170 | 00353 | 000053 | .43   | DEC 43    |
| 0171 | 00354 | 000055 | .45   | DEC 45    |
| 0172 | 00355 | 000056 | .46   | DEC 46    |
| 0173 | 00356 | 000057 | .47   | DEC 47    |
| 0174 | 00357 | 000060 | .48   | DEC 48    |
| 0175 | 00360 | 000061 | .49   | DEC 49    |
| 0176 | 00361 | 000072 | .58   | DEC 58    |
| 0177 | 00362 | 000077 | .63   | DEC 63    |
| 0178 | 00363 | 000100 | B100  | OCT 100   |
| 0179 | 00364 | 000105 | E     | OCT 105   |
| 0180 | 00365 | 000106 | F     | OCT 106   |
| 0181 | 00366 | 000110 | .72   | DEC 72    |
| 0182 | 00367 | 000112 | .74   | DEC 74    |
| 0183 | 00370 | 000113 | .75   | DEC 75    |
| 0184 | 00371 | 000116 | N     | OCT 116   |
| 0185 | 00372 | 000123 | S     | OCT 123   |
| 0186 | 00373 | 000133 | B133  | OCT 133   |
| 0187 | 00374 | 000177 | B177  | OCT 177   |
| 0188 | 00375 | 000200 | B200  | OCT 200   |
| 0189 | 00376 | 000377 | MSK0  | OCT 377   |
| 0190 | 00377 | 000400 | B400  | OCT 400   |
| 0191 | 00400 | 000776 | B776  | OCT 776   |
| 0192 | 00401 | 000777 | MSK1  | OCT 777   |
| 0193 | 00402 | 001000 | B1000 | OCT 1000  |
| 0194 | 00403 | 002000 | B2000 | OCT 2000  |
| 0195 | 00404 | 003000 | B3000 | OCT 3000  |
| 0196 | 00405 | 003002 | SCCNT | OCT 3002  |
| 0197 | 00406 | 004000 | B4000 | OCT 4000  |
| 0198 | 00407 | 005000 | LF    | OCT 5000  |
| 0199 | 00410 | 014000 | B1400 | OCT 14000 |
| 0200 | 00411 | 021000 | UNMNC | OCT 21000 |
| 0201 | 00412 | 022000 | B2200 | OCT 22000 |
| 0202 | 00413 | 023000 | B2300 | OCT 23000 |

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|      |       |        |       |     |              |                           |
|------|-------|--------|-------|-----|--------------|---------------------------|
| 0203 | 00414 | 035000 | DEFOP | OCT | 35000        |                           |
| 0204 | 00415 | 036000 | REMOP | OCT | 36000        |                           |
| 0205 | 00416 | 052000 | RDCP  | OCT | 52000        |                           |
| 0206 | 00417 | 063146 | TENTH | OCT | 63146        |                           |
| 0207 | 00420 | 077000 | OPMSK | OCT | 77000        |                           |
| 0208 | 00421 | 077600 | MSK4  | OCT | 77600        |                           |
| 0209 | 00422 | 077777 | INF   | OCT | 77777        |                           |
| 0210 | 00423 | 100017 | TYPFL | OCT | 100017       |                           |
| 0211 | 00424 | 100037 | TABCN | OCT | 100037       |                           |
| 0212 | 00425 | 100777 | OPDMK | OCT | 100777       |                           |
| 0213 | 00426 | 130000 | RMODE | OCT | 130000       |                           |
| 0214 | 00427 | 140000 | UNARM | OCT | 140000       |                           |
| 0215 | 00430 | 174000 | HIMSK | OCT | 174000       |                           |
| 0216 | 00431 | 177777 | M1    | DEC | -1           |                           |
| 0217 | 00432 | 177776 | M2    | DEC | -2           |                           |
| 0218 | 00433 | 177775 | M3    | DEC | -3           |                           |
| 0219 | 00434 | 177774 | M4    | DEC | -4           |                           |
| 0220 | 00435 | 177773 | M5    | DEC | -5           |                           |
| 0221 | 00436 | 177772 | M6    | DEC | -6           |                           |
| 0222 | 00437 | 177771 | M7    | DEC | -7           |                           |
| 0223 | 00440 | 177770 | M8    | DEC | -8           |                           |
| 0224 | 00441 | 177767 | M9    | DEC | -9           |                           |
| 0225 | 00442 | 177766 | M10   | DEC | -10          |                           |
| 0226 | 00443 | 177765 | M11   | DEC | -11          |                           |
| 0227 | 00444 | 177761 | M15   | DEC | -15          |                           |
| 0228 | 00445 | 177760 | M16   | DEC | -16          |                           |
| 0229 | 00446 | 177753 | M21   | DEC | -21          |                           |
| 0230 | 00447 | 177747 | M25   | DEC | -25          |                           |
| 0231 | 00450 | 177740 | M32   | DEC | -32          |                           |
| 0232 | 00451 | 177725 | D53   | OCT | -53          |                           |
| 0233 | 00452 | 177706 | D72   | OCT | -72          |                           |
| 0234 | 00453 | 177700 | D100  | OCT | -100         |                           |
| 0235 | 00454 | 177670 | M72   | DEC | -72          |                           |
| 0236 | 00455 | 177667 | M73   | DEC | -73          |                           |
| 0237 | 00456 | 177664 | M76   | DEC | -76          |                           |
| 0238 | 00457 | 177645 | D133  | OCT | -133         |                           |
| 0239 | 00460 | 177400 | M256  | DEC | -256         |                           |
| 0240 | 00461 | 177312 | M310  | DEC | -310         |                           |
| 0241 | 00462 | 176030 | M1000 | DEC | -1000        |                           |
| 0242 | 00463 | 154360 | MAX9N | DEC | -10000       |                           |
| 0243 | 00437 |        | MSK3  | EQU | M7           |                           |
| 0244 | 00464 | 043116 | FN    | ASC | 1, FN        |                           |
| 0245 | 00465 | 037440 | QMARK | ASC | 1, ?         |                           |
| 0246 | 00466 | 040000 | HALF  | OCT | 40000        |                           |
| 0247 | 00467 | 000000 |       | OCT | 0            |                           |
| 0248 | 00466 |        | HONE  | EQU | HALF         |                           |
| 0249 | 00470 | 100000 | MNEG  | OCT | 100000       | MAXIMUM NEGATIVE FLOATING |
| 0250 | 00471 | 000376 |       | OCT | 376          | POINT NUMBER              |
| 0251 | 00470 |        | FLGBT | EQU | MNEG         |                           |
| 0252 | 00472 | 102756 | MAXFX | DEC | -999999.5    |                           |
| 0253 | 00474 | 114631 | MINFX | DEC | -0.099999959 |                           |
| 0254 | 00476 | 000040 | BLANK | OCT | 40           |                           |

0256\*\*

0257\*\*\* EMIT ERROR MESSAGE \*\*

0258\*\*

|      |       |        |             |                            |
|------|-------|--------|-------------|----------------------------|
| 0259 | 00477 | 000000 | ERROR NOP   |                            |
| 0260 | 00500 | 060130 | LDA TLSTR   | SHIFT TO                   |
| 0261 | 00501 | 070127 | STA LISTR   | COMMAND MODE               |
| 0262 | 00502 | 060133 | LDA CCNT    | SAVE                       |
| 0263 | 00503 | 071515 | STA OPCHK   | OUTPUT                     |
| 0264 | 00504 | 060132 | LDA BADDR   | BUFFER                     |
| 0265 | 00505 | 071536 | STA RSCHK   | POINTERS                   |
| 0266 | 00506 | 060274 | LDA EBFA    | SET BUFFER                 |
| 0267 | 00507 | 070132 | STA BADDR   | POINTER                    |
| 0268 | 00510 | 060332 | LDA .8      | SET CHARACTER              |
| 0269 | 00511 | 070133 | STA CCNT    | COUNT                      |
| 0270 | 00512 | 064477 | LDB ERROR   | ERROR SOURCE IN (B)        |
| 0271 | 00513 | 060277 | LDA ERBS    | ERROR ADDRESS IN (A)       |
| 0272 | 00514 | 002004 | INA         | MOVE TO NEXT ERROR         |
| 0273 | 00515 | 154000 | CPB 0,1     | SAME AS ACTUAL ERROR?      |
| 0274 | 00516 | 003005 | CMA,INA,RSS | YES                        |
| 0275 | 00517 | 024514 | JMP *-3     | NO                         |
| 0276 | 00520 | 040277 | ADA ERBS    | COMPUTE ERROR              |
| 0277 | 00521 | 071643 | STA ENOUT   | SAVE NEGATIVE OF ERROR     |
| 0278 | 00522 | 003004 | CMA,INA     | NUMBER                     |
| 0279 | 00523 | 114222 | JSB OUTIA,I | NUMBER TO BUFFER           |
| 0280 | 00524 | 064273 | LDB EBUFA   | LOAD BUFFER ADDRESS        |
| 0281 | 00525 | 060133 | LDA CCNT    | LOAD NEGATIVE OF           |
| 0282 | 00526 | 003004 | CMA,INA     | CHARACTER COUNT            |
| 0283 | 00527 | 114102 | JSB WRITE,I | OUTPUT ERROR MESSAGE       |
| 0284 | 00530 | 060276 | LDA LNBFA   | OUTPUT                     |
| 0285 | 00531 | 070132 | STA BADDR   |                            |
| 0286 | 00532 | 060334 | LDA .10     |                            |
| 0287 | 00533 | 070133 | STA CCNT    | LINE                       |
| 0288 | 00534 | 060145 | LDA .LNUM   |                            |
| 0289 | 00535 | 114222 | JSB OUTIA,I |                            |
| 0290 | 00536 | 064275 | LDB LBUFA   | NUMBER                     |
| 0291 | 00537 | 060133 | LDA CCNT    |                            |
| 0292 | 00540 | 114102 | JSB WRITE,I |                            |
| 0293 | 00541 | 061643 | LDA ENOUT   | RETRIEVE NEGATIVE OF ERROR |
| 0294 | 00542 | 040300 | ADA RECER   | RECOVERABLE                |
| 0295 | 00543 | 002021 | SSA,RSS     | ERROR?                     |
| 0296 | 00544 | 124204 | JMP PEXMA,I | NO, RETURN TO SYNTAX MODE  |
| 0297 | 00545 | 060426 | LDA RMODE   | RETURN TO                  |
| 0298 | 00546 | 070127 | STA LISTR   | RUN MODE                   |
| 0299 | 00547 | 061515 | LDA OPCHK   | RESTORE                    |
| 0300 | 00550 | 070133 | STA CCNT    | OUTPUT                     |
| 0301 | 00551 | 061536 | LDA RSCHK   | BUFFER                     |
| 0302 | 00552 | 070132 | STA BADDR   | POINTERS                   |
| 0303 | 00553 | 124477 | JMP ERROR,I | RETURN TO PROGRAM          |



0305\*\*

0306\*\*\* MOVE WORDS TO HIGHER CORE \*\*

0307\*\*

|      |       |        |       |          |                      |
|------|-------|--------|-------|----------|----------------------|
| 0308 | 00554 | 000000 | MVTOH | NOP      |                      |
| 0309 | 00555 | 064162 | LDB   | TEMP2    | FETCH SOURCE ADDRESS |
| 0310 | 00556 | 054163 | MVTO1 | CPB      | TEMP3                |
| 0311 | 00557 | 124554 | JMP   | MVTOH, I | ALL RELOCATION DONE? |
| 0312 | 00560 | 003400 | CCA   |          | YES, EXIT            |
| 0313 | 00561 | 040164 | ADA   | TEMP4    | BACK UP              |
| 0314 | 00562 | 070164 | STA   | TEMP4    | SOURCE AND           |
| 0315 | 00563 | 044431 | ADB   | M1       | DESTINATION          |
| 0316 | 00564 | 160001 | LDA   | 1, I     | ADDRESSES            |
| 0317 | 00565 | 170164 | STA   | TEMP4, I | MOVE                 |
| 0318 | 00566 | 024556 | JMP   | MVTO1    | WORD                 |

0319\*\*

0320\*\*\* INPUT A CONSTANT \*\*

0321\*\*

|      |       |        |          |          |                         |
|------|-------|--------|----------|----------|-------------------------|
| 0322 | 00567 | 000000 | CONST    | NOP      |                         |
| 0323 | 00570 | 015614 | JSB      | GETCR    |                         |
| 0324 | 00571 | 124567 | JMP      | CONST, I |                         |
| 0325 | 00572 | 006400 | CLB      |          | SET SIGN                |
| 0326 | 00573 | 074153 | STB      | SIGN     | POSITIVE                |
| 0327 | 00574 | 006004 | INB      |          |                         |
| 0328 | 00575 | 050353 | CPA      | .43      | '+' ?                   |
| 0329 | 00576 | 024602 | JMP      | CONS1    | YES                     |
| 0330 | 00577 | 050354 | CPA      | .45      | NO, '-' ?               |
| 0331 | 00600 | 007401 | CCB, RSS |          | YES                     |
| 0332 | 00601 | 024605 | JMP      | CONS2    | NO                      |
| 0333 | 00602 | 074153 | CONS1    | STB      | SIGN                    |
| 0334 | 00603 | 015614 | JSB      | GETCR    | RECORD SIGN             |
| 0335 | 00604 | 024613 | JMP      | SYE12-1  | FETCH NEXT              |
| 0336 | 00605 | 014615 | CONS2    | JSB      | NUMCK                   |
| 0337 | 00606 | 024611 | JMP      | CONS3    | CHARACTER               |
| 0338 | 00607 | 034567 | ISZ      | CONST    | FETCH CONSTANT          |
| 0339 | 00610 | 124567 | JMP      | CONST, I | NONE FOUND              |
| 0340 | 00611 | 054153 | CONS3    | CPB      | SIGN                    |
| 0341 | 00612 | 003401 | CCA, RSS |          | SUCCESSFULLY FOUND,     |
| 0342 | 00613 | 014477 | JSB      | ERROR    | EXIT VIA (P+2)          |
| 0343 | 00614 | 124567 | SYE12    | JMP      | CONST, I                |
|      |       |        |          |          | SIGN FOUND? ( (B) = 0 ) |
|      |       |        |          |          | NO                      |
|      |       |        |          |          | YES, SOLITARY SIGN      |
|      |       |        |          |          | EXIT VIA (P+1)          |

0344\*\*

0345\*\*\* FETCH NUMBER AND CONVERT TO BINARY \*\*

0346\*\*

|      |       |        |       |       |                               |
|------|-------|--------|-------|-------|-------------------------------|
| 0347 | 00615 | 000000 | NUMCK | NOP   | CHARACTER IN (A), SIGN SET    |
| 0348 | 00616 | 006400 | CLB   |       |                               |
| 0349 | 00617 | 074154 | STB   | EXP   | ZERO                          |
| 0350 | 00620 | 075274 | STB   | MANT1 | ALL                           |
| 0351 | 00621 | 075336 | STB   | MANT2 | COMPONENTS                    |
| 0352 | 00622 | 075603 | STB   | EXPON | OF NUMBER                     |
| 0353 | 00623 | 074163 | STB   | TEMP3 | SET 'NUMBER' FLAG FALSE       |
| 0354 | 00624 | 007400 | CCB   |       | SET 'DECIMAL POINT'           |
| 0355 | 00625 | 075633 | STB   | DPFLG | FLAG FALSE                    |
| 0356 | 00626 | 050355 | NUMC1 | CPA   | .46                           |
| 0357 | 00627 | 035633 | ISZ   | DPFLG | DECIMAL POINT?                |
| 0358 | 00630 | 024634 | JMP   | NUMC2 | YES, SET FLAG TRUE            |
| 0359 | 00631 | 002400 | CLA   |       | NO                            |
| 0360 | 00632 | 071603 | STA   | EXPON | INITIALIZE POST-DECIMAL DIGIT |
|      |       |        |       |       | DIGIT COUNTER TO ZERO         |

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|      |       |        |       |             |                                |
|------|-------|--------|-------|-------------|--------------------------------|
| 0361 | 00633 | 024653 |       | JMP NUMC3+1 | FETCH A CHARACTER              |
| 0362 | 00634 | 015570 | NUMC2 | JSB DIGCK   | DIGIT?                         |
| 0363 | 00635 | 024706 |       | JMP NUMC7   | NO                             |
| 0364 | 00636 | 035603 |       | ISZ EXPON   | YES, COUNT DIGIT               |
| 0365 | 00637 | 001727 |       | ALF,ALF     | LEFT-JUSTIFY                   |
| 0366 | 00640 | 001723 |       | ALF,RAR     | DIGIT AND                      |
| 0367 | 00641 | 070164 |       | STA TEMP4   | SAVE IT                        |
| 0368 | 00642 | 015147 |       | JSB MBY10   | MULTIPLY PREVIOUS NUMBER BY 10 |
| 0369 | 00643 | 064154 |       | LDB EXP     |                                |
| 0370 | 00644 | 006002 |       | SZB         | ZERO EXPONENT?                 |
| 0371 | 00645 | 024657 |       | JMP NUMC4   | NO                             |
| 0372 | 00646 | 060327 |       | LDA .4      | YES, SET                       |
| 0373 | 00647 | 070154 |       | STA EXP     | EXPONENT TO 4                  |
| 0374 | 00650 | 060164 |       | LDA TEMP4   | LOAD                           |
| 0375 | 00651 | 006400 |       | CLB         | NUMBER                         |
| 0376 | 00652 | 015113 | NUMC3 | JSB NORML   | NORMALIZE THE NUMBER           |
| 0377 | 00653 | 034163 |       | ISZ TEMP3   | SET 'NUMBER OCCURRED' FLAG     |
| 0378 | 00654 | 015614 |       | JSB GETCR   | ANOTHER CHARACTER?             |
| 0379 | 00655 | 024755 |       | JMP NUM12   | NO                             |
| 0380 | 00656 | 024626 |       | JMP NUMC1   | YES                            |
| 0381 | 00657 | 044434 | NUMC4 | ADB M4      | COMPUTE                        |
| 0382 | 00660 | 007000 |       | CMB         | EXPONENT                       |
| 0383 | 00661 | 060164 |       | LDA TEMP4   | BIAS AND                       |
| 0384 | 00662 | 074164 |       | STB TEMP4   | SAVE IT                        |
| 0385 | 00663 | 006400 |       | CLB         |                                |
| 0386 | 00664 | 034164 | NUMC5 | ISZ TEMP4   | DIGIT POSITIONED?              |
| 0387 | 00665 | 024703 |       | JMP NUMC6   | NO                             |
| 0388 | 00666 | 000040 |       | CLE         | YES, ADD IN                    |
| 0389 | 00667 | 045336 |       | ADB MANT2   | LOW PART                       |
| 0390 | 00670 | 103101 |       | CLO         | OF NUMBER                      |
| 0391 | 00671 | 002040 |       | SEZ         | OVERFLOW?                      |
| 0392 | 00672 | 002004 |       | INA         | YES, BUMP (A)                  |
| 0393 | 00673 | 041274 |       | ADA MANT1   | ADD IN HIGH PART OF NUMBER     |
| 0394 | 00674 | 102301 |       | SOS         | OVERFLOW?                      |
| 0395 | 00675 | 024652 |       | JMP NUMC3   | NO                             |
| 0396 | 00676 | 000065 |       | CLE,ERA     | YES, ROTATE                    |
| 0397 | 00677 | 005500 |       | ERB         | DOWN AND                       |
| 0398 | 00700 | 034154 |       | ISZ EXP     | BUMP                           |
| 0399 | 00701 | 000000 |       | NOP         | EXPONENT                       |
| 0400 | 00702 | 024652 |       | JMP NUMC3   |                                |
| 0401 | 00703 | 000065 | NUMC6 | CLE,ERA     | SHIFT                          |
| 0402 | 00704 | 005500 |       | ERB         | DIGIT                          |
| 0403 | 00705 | 024664 |       | JMP NUMC5   | RIGHT                          |
| 0404 | 00706 | 006400 | NUMC7 | CLB         | DECIMAL POINT                  |
| 0405 | 00707 | 074164 |       | STB TEMP4   |                                |
| 0406 | 00710 | 054163 |       | CPB TEMP3   | OR DIGIT FOUND?                |
| 0407 | 00711 | 124615 |       | JMP NUMCK,I | NO, EXIT VIA (P+1)             |
| 0408 | 00712 | 050364 |       | CPA E       | YES, 'E' ?                     |
| 0409 | 00713 | 002001 |       | RSS         | YES                            |
| 0410 | 00714 | 024755 |       | JMP NUM12   | NO, NO EXPONENT PART           |
| 0411 | 00715 | 015614 |       | JSB GETCR   |                                |
| 0412 | 00716 | 014477 | NUMER | JSB ERROR   |                                |
| 0413 | 00717 | 050353 |       | CPA .43     | '+' ?                          |
| 0414 | 00720 | 024725 |       | JMP NUMC8   | YES                            |
| 0415 | 00721 | 050354 |       | CPA .45     | NO, '-' ?                      |
| 0416 | 00722 | 003401 |       | CCA,RSS     | YES                            |

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|      |       |        |       |                 |                              |
|------|-------|--------|-------|-----------------|------------------------------|
| 0417 | 00723 | 024727 |       | JMP NUMC9       | NO                           |
| 0418 | 00724 | 070164 |       | STA TEMP4       | NOTE MINUS SIGN              |
| 0419 | 00725 | 015614 | NUMC8 | JSB GETCR       |                              |
| 0420 | 00726 | 024716 |       | JMP NUMER       |                              |
| 0421 | 00727 | 015570 | NUMC9 | JSB DIGCK       | DIGIT?                       |
| 0422 | 00730 | 024716 |       | JMP NUMER       | NO                           |
| 0423 | 00731 | 070163 |       | STA TEMP3       | YES, SAVE IT                 |
| 0424 | 00732 | 015614 |       | JSB GETCR       |                              |
| 0425 | 00733 | 024751 |       | JMP NUM10       | SECOND                       |
| 0426 | 00734 | 015570 |       | JSB DIGCK       | DIGIT?                       |
| 0427 | 00735 | 024751 |       | JMP NUM10       | NO                           |
| 0428 | 00736 | 064163 |       | LDB TEMP3       | YES                          |
| 0429 | 00737 | 005020 |       | BLS,BLS         | MULTIPLY                     |
| 0430 | 00740 | 044163 |       | ADB TEMP3       | PRIOR DIGIT                  |
| 0431 | 00741 | 005000 |       | BLS             | BY 10                        |
| 0432 | 00742 | 040001 |       | ADA 1           | ADD NEW DIGIT                |
| 0433 | 00743 | 070163 |       | STA TEMP3       | SAVE EXPONENT                |
| 0434 | 00744 | 015614 |       | JSB GETCR       |                              |
| 0435 | 00745 | 024751 |       | JMP NUM10       | THIRD                        |
| 0436 | 00746 | 015570 |       | JSB DIGCK       | DIGIT?                       |
| 0437 | 00747 | 002001 |       | RSS             | NO                           |
| 0438 | 00750 | 024716 |       | JMP NUMER       | YES                          |
| 0439 | 00751 | 060163 | NUM10 | LDA TEMP3       | LOAD EXPONENT                |
| 0440 | 00752 | 034164 |       | ISZ TEMP4       | POSITIVE?                    |
| 0441 | 00753 | 003004 |       | CMA,INA         | YES, COMPLEMENT IT           |
| 0442 | 00754 | 002001 |       | RSS             | NO                           |
| 0443 | 00755 | 002400 | NUM12 | CLA             | CLEAR IF NO EXPONENT PART    |
| 0444 | 00756 | 035633 |       | ISZ DPFLG       | DECIMAL POINT?               |
| 0445 | 00757 | 041603 |       | ADA EXPON       | YES, CORRECT EXPONENT        |
| 0446 | 00760 | 002003 |       | SZA,RSS         | ZERO EXPONENT?               |
| 0447 | 00761 | 024776 |       | JMP NUM14       | YES                          |
| 0448 | 00762 | 002020 |       | SSA             | NO, NEGATIVE EXPONENT?       |
| 0449 | 00763 | 024772 |       | JMP NUM13       | NO                           |
| 0450 | 00764 | 003004 |       | CMA,INA         | YES, SET                     |
| 0451 | 00765 | 071603 |       | STA EXPON       | COUNTER                      |
| 0452 | 00766 | 015200 |       | JSB DBY10       | DIVIDE NUMBER BY 10          |
| 0453 | 00767 | 035603 |       | ISZ EXPON       | DONE?                        |
| 0454 | 00770 | 024766 |       | JMP *-2         | NO                           |
| 0455 | 00771 | 024776 |       | JMP NUM14       | YES                          |
| 0456 | 00772 | 071603 | NUM13 | STA EXPON       | SET COUNTER                  |
| 0457 | 00773 | 015147 |       | JSB MBY10       | MULTIPLY BY 10               |
| 0458 | 00774 | 035603 |       | ISZ EXPON       | DONE?                        |
| 0459 | 00775 | 024773 |       | JMP *-2         | NO                           |
| 0460 | 00776 | 061274 | NUM14 | LDA MANT1       | YES, LOAD                    |
| 0461 | 00777 | 065336 |       | LDB MANT2       | NUMBER                       |
| 0462 | 01000 | 034153 |       | ISZ SIGN        | POSITIVE?                    |
| 0463 | 01001 | 025005 |       | JMP NUM15       | YES                          |
| 0464 | 01002 | 003000 |       | CMA             | NO,                          |
| 0465 | 01003 | 007007 |       | CMB,INB,SZB,RSS | COMPLEMENT                   |
| 0466 | 01004 | 002004 |       | INA             | IT                           |
| 0467 | 01005 | 015020 | NUM15 | JSB .PACK       | PACK NUMBER INTO (A) AND (B) |
| 0468 | 01006 | 034135 |       | ISZ SBPTR       |                              |
| 0469 | 01007 | 170135 |       | STA SBPTR,I     | STORE                        |
| 0470 | 01010 | 034135 |       | ISZ SBPTR       | NUMBER IN                    |
| 0471 | 01011 | 174135 |       | STB SBPTR,I     | PROPER                       |
| 0472 | 01012 | 034135 |       | ISZ SBPTR       | LOCATION                     |

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|   |       |        |                 |                               |
|---|-------|--------|-----------------|-------------------------------|
| 0473  | 01013 | 015633 | JSB BCKSP       | FETCH                         |
| 0474  | 01014 | 015614 | JSB GETCH       | FIRST                         |
| 0475  | 01015 | 060334 | LDA .10         | UNUSED CHARACTER              |
| 0476  | 01016 | 034615 | ISZ NUMCK       | RETURN                        |
| 0477  | 01017 | 124615 | JMP NUMCK,I     | VIA (P+2)                     |
| 0478**  |       |        |                 |                               |
| 0479*** NORMALIZE AND PACK FLOATING POINT NUMBER ** |       |        |                 |                               |
| 0480**  |       |        |                 |                               |
| 0481  | 01020 | 000000 | .PACK NOP       | MANTISSA IN (A) AND (B),      |
| 0482  | 01021 | 015113 | JSB NORML       | EXPONENT IN EXP, (E) CLEARED  |
| 0483  | 01022 | 002103 | CLE,SZA,RSS     | ZERO RESULT?                  |
| 0484  | 01023 | 125020 | JMP .PACK,I     | YES                           |
| 0485  | 01024 | 044374 | ADB B177        | NO, ROUND                     |
| 0486  | 01025 | 002021 | SSA,RSS         | POSITIVE NUMBER?              |
| 0487  | 01026 | 006004 | INB             | YES, FINISH ROUND             |
| 0488  | 01027 | 103101 | CLO             |                               |
| 0489  | 01030 | 002040 | SEZ             | OVERFLOW FROM (B)?            |
| 0490  | 01031 | 002104 | CLE,INA         | YES, BUMP (A)                 |
| 0491  | 01032 | 102301 | SOS             | OVERFLOW? (A=100000, B=0)     |
| 0492  | 01033 | 001200 | RAL             |                               |
| 0493  | 01034 | 002031 | SSA,SLA,RSS     | TWO HIGH BITS 1'S? (A=140000) |
| 0494  | 01035 | 025040 | JMP PACK1       | NO                            |
| 0495  | 01036 | 002300 | CCE             | YES                           |
| 0496  | 01037 | 001130 | ARS,SLA,ALS     | SET (A) =100000 AND SKIP      |
| 0497  | 01040 | 001300 | PACK1 RAR       | COUNTERPART TO *-5            |
| 0498  | 01041 | 071147 | STA MBY10       | SAVE (A)                      |
| 0499  | 01042 | 060001 | LDA 1           | DELETE 8 LOW                  |
| 0500  | 01043 | 010460 | AND M256        | ORDER BITS OF MANTISSA        |
| 0501  | 01044 | 070001 | STA 1           | SAVE LOWER MANTISSA           |
| 0502  | 01045 | 060154 | LDA EXP         | FETCH EXPONENT                |
| 0503  | 01046 | 002040 | SEZ             | DECREMENT EXPONENT?           |
| 0504  | 01047 | 040431 | ADA M1          | YES                           |
| 0505  | 01050 | 102201 | SOC             | NO, PRIOR OVERFLOW?           |
| 0506  | 01051 | 002004 | INA             | YES, INCREMENT EXPONENT       |
| 0507  | 01052 | 040375 | ADA B200        | NO, EXPONENT                  |
| 0508  | 01053 | 002020 | SSA             | UNDERFLOW?                    |
| 0509  | 01054 | 025073 | JMP PACK3       | YES                           |
| 0510  | 01055 | 040460 | ADA M256        | NO, EXPONENT                  |
| 0511  | 01056 | 002021 | SSA,RSS         | OVERFLOW?                     |
| 0512  | 01057 | 025077 | JMP PACK4       | YES                           |
| 0513  | 01060 | 040375 | ADA B200        | NO, RESTORE EXPONENT,         |
| 0514  | 01061 | 001200 | RAL             | POSITION SIGN,                |
| 0515  | 01062 | 010376 | AND MSK0        | MASK TO 8 BITS, AND           |
| 0516  | 01063 | 044000 | ADB 0           | COMBINE WITH LOW MANTISSA     |
| 0517  | 01064 | 061147 | LDA MBY10       | RETRIEVE HIGH MANTISSA        |
| 0518  | 01065 | 050470 | CPA MNEG        |                               |
| 0519  | 01066 | 002001 | RSS             | NEGATIVE                      |
| 0520  | 01067 | 125020 | JMP .PACK,I     |                               |
| 0521  | 01070 | 054471 | CPB MNEG+1      | OVERFLOW?                     |
| 0522  | 01071 | 025077 | JMP PACK4       | YES                           |
| 0523  | 01072 | 125020 | JMP .PACK,I     | NO                            |
| 0524  | 01073 | 014477 | PACK3 JSB ERROR |                               |
| 0525  | 01074 | 002400 | UNDER CLA       | ZERO RESULT                   |
| 0526  | 01075 | 006400 | CLB             | ON UNDERFLOW                  |
| 0527  | 01076 | 125020 | JMP .PACK,I     |                               |
| 0528  | 01077 | 014477 | PACK4 JSB ERROR |                               |

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0529 01100 061147 OVRER LDA MBY10
0530 01101 015103 JSB OVFLW
0531 01102 125020 JMP .PACK,I
0532**
0533*** LOAD INFINITY ON OVERFLOW **
0534**
0535 01103 000000 OVFLW NOP
0536 01104 064432 LDB M2 LOAD
0537 01105 002020 SSA APPROPRIATE
0538 01106 064400 LDB B776 LOW MANTISSA
0539 01107 030422 IOR INF LOAD
0540 01110 002020 SSA APPROPRIATE
0541 01111 060470 LDA MNEG HIGH MANTISSA
0542 01112 125103 JMP OVFLW,I
0543**
0544*** NORMALIZE (A), (B), AND EXP **
0545**
0546 01113 000000 NORML NOP SET
0547 01114 071147 STA MBY10 LEFT-SHIFT
0548 01115 002400 CLA COUNTER
0549 01116 071236 STA MPY TO ZERO
0550 01117 061147 LDA MBY10
0551 01120 002003 SZA,RSS ON
0552 01121 006002 SZB ZERO
0553 01122 025130 JMP NORM3 CLEAR
0554 01123 070154 STA EXP EVERYTHING
0555 01124 071274 STA MANT1 STORE
0556 01125 075336 NORM1 STB MANT2 MANTISSA
0557 01126 125113 JMP NORML,I AND RETURN
0558 01127 035236 NORM2 ISZ MPY COUNT LEFT SHIFTS
0559 01130 004066 NORM3 CLE,ELB ROTATE (A) AND
0560 01131 001600 ELA (B) LEFT INTO (E)
0561 01132 002061 SEZ,SSA,RSS TWO HIGHEST BITS 0?
0562 01133 025127 JMP NORM2 YES, + UNNORMALIZED
0563 01134 002060 SEZ,SSA NO, TWO HIGHEST BITS 1?
0564 01135 025127 JMP NORM2 YES, - UNNORMALIZED
0565 01136 001500 ERA SHIFT TO
0566 01137 005540 ERB,CLE NORMALIZE MANTISSA
0567 01140 071274 STA MANT1 NO,
0568 01141 061236 LDA MPY COMPUTE
0569 01142 003004 CMA,INA CORRECTED
0570 01143 040154 ADA EXP EXPONENT
0571 01144 070154 STA EXP VALUE
0572 01145 061274 LDA MANT1
0573 01146 025125 JMP NORM1
0574**
0575*** MULTIPLY UNPACKED NUMBER BY 10 **
0576**
0577 01147 000000 MBY10 NOP
0578 01150 061274 LDA MANT1 RETURN ON
0579 01151 002003 SZA,RSS ZERO
0580 01152 125147 JMP MBY10,I MANTISSA
0581 01153 064154 LDB EXP MULTIPLY
0582 01154 044326 ADB .3 BY
0583 01155 074154 STB EXP 8
0584 01156 065336 LDB MANT2 LOAD MANTISSA

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|        |                                 |        |             |                                 |
|--------|---------------------------------|--------|-------------|---------------------------------|
| 0585   | 01157                           | 000065 | CLE,ERA     | DIVIDE                          |
| 0586   | 01160                           | 005500 | ERB         | BY                              |
| 0587   | 01161                           | 000065 | CLE,ERA     | 4                               |
| 0588   | 01162                           | 005540 | ERB,CLE     |                                 |
| 0589   | 01163                           | 045336 | ADB MANT2   | DOUBLE                          |
| 0590   | 01164                           | 002040 | SEZ         | ADD TO                          |
| 0591   | 01165                           | 002004 | INA         | PRODUCE                         |
| 0592   | 01166                           | 041274 | ADA MANT1   | 1.25 * MANTISSA                 |
| 0593   | 01167                           | 002021 | SSA,RSS     | CORRECT                         |
| 0594   | 01170                           | 025175 | JMP **5     |                                 |
| 0595   | 01171                           | 000065 | CLE,ERA     | ON                              |
| 0596   | 01172                           | 005500 | ERB         |                                 |
| 0597   | 01173                           | 034154 | ISZ EXP     | OVERFLOW                        |
| 0598   | 01174                           | 000000 | NOP         |                                 |
| 0599   | 01175                           | 071274 | STA MANT1   |                                 |
| 0600   | 01176                           | 075336 | STB MANT2   |                                 |
| 0601   | 01177                           | 125147 | JMP MBY10,I |                                 |
| 0602** |                                 |        |             |                                 |
| 0603** | DIVIDE UNPACKED NUMBER BY 10 ** |        |             |                                 |
| 0604** |                                 |        |             |                                 |
| 0605   | 01200                           | 000000 | DBY10 NOP   | MULTIPLY BY DOUBLE-LENGTH TENTH |
| 0606   | 01201                           | 061274 | LDA MANT1   | RETURN                          |
| 0607   | 01202                           | 002003 | SZA,RSS     | ON ZERO                         |
| 0608   | 01203                           | 125200 | JMP DBY10,I | MANTISSA                        |
| 0609   | 01204                           | 064432 | LDB M2      | ADD EXPONENT OF                 |
| 0610   | 01205                           | 044154 | ADB EXP     | 'TENTH' TO                      |
| 0611   | 01206                           | 074154 | STB EXP     | MANTISSA EXPONENT               |
| 0612   | 01207                           | 061336 | LDA MANT2   | JUSTIFY                         |
| 0613   | 01210                           | 000065 | CLE,ERA     | LOWER MANTISSA                  |
| 0614   | 01211                           | 015236 | JSB MPY     | MULTIPLY BY                     |
| 0615   | 01212                           | 000417 | DEF TENTH   | 63146 (ONE-TENTH)               |
| 0616   | 01213                           | 000066 | CLE,ELA     | SHIFT                           |
| 0617   | 01214                           | 005640 | ELB,CLE     | BACK                            |
| 0618   | 01215                           | 040001 | ADA 1       | ADD IN LOWER MANTISSA*          |
| 0619   | 01216                           | 002040 | SEZ         | TENTH*(2)-16                    |
| 0620   | 01217                           | 006004 | INB         | AND ROUND                       |
| 0621   | 01220                           | 075336 | STB MANT2   | TO 16 BITS                      |
| 0622   | 01221                           | 061274 | LDA MANT1   | DO                              |
| 0623   | 01222                           | 015236 | JSB MPY     | SAME                            |
| 0624   | 01223                           | 000417 | DEF TENTH   | FOR                             |
| 0625   | 01224                           | 000040 | CLE         | HIGH                            |
| 0626   | 01225                           | 040001 | ADA 1       | MANTISSA                        |
| 0627   | 01226                           | 041336 | ADA MANT2   | (EFFECTIVELY) SUM               |
| 0628   | 01227                           | 002040 | SEZ         | DOUBLE-LENGTH                   |
| 0629   | 01230                           | 006004 | INB         | PRODUCTS                        |
| 0630   | 01231                           | 075274 | STB MANT1   | EXCHANGE                        |
| 0631   | 01232                           | 070001 | STA 1       | (A) AND (B)                     |
| 0632   | 01233                           | 061274 | LDA MANT1   | REGISTERS                       |
| 0633   | 01234                           | 015113 | JSB NORML   | NORMALIZE RESULT                |
| 0634   | 01235                           | 125200 | JMP DBY10,I |                                 |

0001\*\*

0002\*\*\* MULTIPLY INTEGER IN (A) \*\*

0003\*\*

|      |       |        |      |                    |                                 |
|------|-------|--------|------|--------------------|---------------------------------|
| 0004 | 01236 | 000000 | MPY  | NOP                | ADDRESS OF MULTIPLIER IN MPY, I |
| 0005 | 01237 | 064432 |      | LDB M2             | SET -2 IN                       |
| 0006 | 01240 | 075147 |      | STB MBY10          | SIGN TEMP                       |
| 0007 | 01241 | 165236 |      | LDB MPY, I         | LOAD                            |
| 0008 | 01242 | 164001 |      | LDB 1, I           | MULTIPLIER                      |
| 0009 | 01243 | 002120 |      | CLE, SSA           | (A) NEGATIVE?                   |
| 0010 | 01244 | 003204 |      | CMA, CME, INA      | YES, COMPLEMENT (A) AND (E)     |
| 0011 | 01245 | 006020 |      | SSB                | (B) NEGATIVE?                   |
| 0012 | 01246 | 007204 |      | CMB, CME, INB      | YES, COMPLEMENT (B) AND (E)     |
| 0013 | 01247 | 002040 |      | SEZ                | (E) = 0?                        |
| 0014 | 01250 | 035147 |      | ISZ MBY10          | NO, SET SIGN OF RESULT NEGATIVE |
| 0015 | 01251 | 075113 |      | STB NORML          | SAVE MULTIPLIER                 |
| 0016 | 01252 | 064445 |      | LDB M16            | SET                             |
| 0017 | 01253 | 074554 |      | STB MVTOM          | COUNTER                         |
| 0018 | 01254 | 006400 |      | CLB                | ZERO PRODUCT                    |
| 0019 | 01255 | 001600 |      | ELA                | BIAS (A) TO LEFT                |
| 0020 | 01256 | 001550 | MPY1 | ERA, CLE, SLA      | SHIFT, TEST,                    |
| 0021 | 01257 | 045113 |      | ADB NORML          | AND ADD UPON                    |
| 0022 | 01260 | 005500 |      | ERB                | NON-ZERO BIT                    |
| 0023 | 01261 | 034554 |      | ISZ MVTOM          | DONE?                           |
| 0024 | 01262 | 025256 |      | JMP MPY1           | NO                              |
| 0025 | 01263 | 001540 |      | ERA, CLE           | YES, ADJUST FINAL RESULT        |
| 0026 | 01264 | 035147 |      | ISZ MBY10          | NEGATIVE RESULT?                |
| 0027 | 01265 | 025271 |      | JMP MPY2           | NO                              |
| 0028 | 01266 | 007100 |      | CMB                | YES,                            |
| 0029 | 01267 | 003007 |      | CMA, INA, SZA, RSS | COMPLEMENT                      |
| 0030 | 01270 | 006004 |      | INB                | RESULT                          |
| 0031 | 01271 | 103101 | MPY2 | CLO                |                                 |
| 0032 | 01272 | 035236 |      | ISZ MPY            |                                 |
| 0033 | 01273 | 125236 |      | JMP MPY, I         |                                 |

0034\*\*

0035\*\*\* FIND AND STORE ONE-CHARACTER OPERATORS \*\*

0036\*\*

|      |       |        |        |              |                           |
|------|-------|--------|--------|--------------|---------------------------|
| 0037 | 01274 | 000000 | SYMCK  | NOP          | CHARACTER IN (A)          |
| 0038 | 01275 | 074165 |        | STB COUNT    | -(ENTRIES TO BE SEARCHED) |
| 0039 | 01276 | 001727 |        | ALF, ALF     | POSITION                  |
| 0040 | 01277 | 030345 |        | IOR .32      | CHARACTER                 |
| 0041 | 01300 | 165274 |        | LDB SYMCK, I | STARTING TABLE ENTRY - 2  |
| 0042 | 01301 | 035274 |        | ISZ SYMCK    | SET RETURN ADDRESS        |
| 0043 | 01302 | 044325 | SYMCK1 | ADB .2       | UPDATE TABLE POINTER      |
| 0044 | 01303 | 150001 |        | CPA 1, I     | MATCH?                    |
| 0045 | 01304 | 025312 |        | JMP SYMCK2   |                           |
| 0046 | 01305 | 034165 |        | ISZ COUNT    | NO, CONTINUE SEARCH?      |
| 0047 | 01306 | 025302 |        | JMP SYMCK1   | YES                       |
| 0048 | 01307 | 001727 |        | ALF, ALF     | NO, RESTORE               |
| 0049 | 01310 | 010374 |        | AND B177     | CHARACTER                 |
| 0050 | 01311 | 125274 |        | JMP SYMCK, I | AND EXIT                  |
| 0051 | 01312 | 003400 | SYMCK2 | CCA          | GET                       |
| 0052 | 01313 | 040001 |        | ADA 1        | INFORMATION               |
| 0053 | 01314 | 160000 |        | LDA 0, I     | WORD                      |
| 0054 | 01315 | 010420 |        | AND OPMSK    | AND                       |
| 0055 | 01316 | 170135 |        | STA SBPTR, I | STORE IT                  |
| 0056 | 01317 | 050410 |        | CPA B1400    |                           |

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0057 01320 124257      JMP F8C1A,I
0058 01321 035274      ISZ SYMCK      RETURN VIA
0059 01322 125274      JMP SYMCK,I      (P+2)
0060**
0061*** FIND CALLED SUBROUTINE **
0062**
0063 01323 000000      FNDSB NOP
0064 01324 074102      STB TEMP2      SAVE SUBROUTINE NUMBER
0065 01325 064121      LDB ASBTB      LOAD (B) WITH SUBROUTINE TABLE
0066 01326 054122      FNDS1 CPB SBTBE  END OF TABLE?
0067 01327 014477      JSB ERROR      YES
0068 01330 160001      CALER LDA 1,I    NO, EXTRACT
0069 01331 010362      AND .63        SUBROUTINE NUMBER
0070 01332 050162      CPA TEMP2      DESIRED ONE?
0071 01333 125323      JMP FNDSB,I    YES
0072 01334 044325      ADB .2        NO, MOVE TO
0073 01335 025326      JMP FNDS1     NEXT TABLE ENTRY

```

```

0075*
0076*
0077*
0078*
0079*
0080*
0081*
0082*
0083*
0084 01336 000000      MDIM NOP
0085 01337 070001      STA 1          STORE PACKED DIMS. TEMPORALILY
0086 01340 010376      AND MSK0
0087 01341 071456      STA .FLUN      STORE # OF COLUMNS
0088 01342 060001      LDA 1
0089 01343 001727      ALF,ALF
0090 01344 010376      AND MSK0      A = # OF ROWS
0091 01345 001000      ALS          DOUBLE FOR FLOATING POINT
0092 01346 015236      JSB MPY
0093 01347 001456      DEF .FLUN      COMPUTE 2*ROWS*COLUMNS
0094 01350 002020      SSA          RESULT < 32768 ?
0095 01351 014477      JSB ERROR      NO, ERROR, DIMENSIONS TOO LARGE
0096 01352 125336      MER9 JMP MDIM,I YES, RETURN

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0098**
0099***  ROUND A SUBSCRIPT TO AN INTEGER  **
0100**
0101*
0102*  RETURNS INTEGER IN [1,32767] (BIASED BY -1)
0103*  OR EXITS TO ERRCR.
0104*
0105  01353 000000 SBFIX NOP          SUBSCRIPT IN (A) AND (B)
0106  01354 015364      JSB IFIX      24-BIT INTEGER?
0107  01355 124272      JMP E6M1A,I    NO
0108  01356 002041      SEZ,RSS        YES, ROUND AND
0109  01357 044431      ADB M1         BIAS BY -1
0110  01360 002003      SZA,RSS        15-BIT
0111  01361 006020      SSB           POSITIVE INTEGER?
0112  01362 124272      JMP E6M1A,I    NO
0113  01363 125353      JMP SBFIX,I    YES
0114**
0115***  INTEGERIZE FLOATING POINT NUMBER  **
0116**
0117  01364 000000 IFIX  NOP
0118  01365 102101      STO
0119  01366 071614      STA GETCR      SAVE (A)
0120  01367 015456      JSB .FLUN      EXPONENT
0121  01370 002020      SSA           NON-NEGATIVE?
0122  01371 025414      JMP IFIX3      NO
0123  01372 040445      ADA M16        YES, EXPONENT
0124  01373 002020      SSA           <= 15?
0125  01374 103101      CLO           YES
0126  01375 040440      ADA M8         EXPONENT
0127  01376 002021      SSA,RSS       <= 23?
0128  01377 125364      JMP IFIX,I     NO, ALL SIGNIFICANCE IS INTEGER
0129  01400 040440      ADA M8         MOVE BINARY POINT TO END OF (B)
0130  01401 071456      STA .FLUN      SAVE SHIFT COUNT
0131  01402 061614      LDA GETCR      RETRIEVE (A)
0132  01403 025410      JMP IFIX2
0133  01404 000071 IFIX1 CLE,SLA,ARS  SHIFT (A) RIGHT
0134  01405 002200      CME           SHIFT (B)
0135  01406 004035      SLB,ERB        RIGHT
0136  01407 102101      STO           NOTE IF A 1 IS LOST
0137  01410 035456 IFIX2 ISZ .FLUN    DONE?
0138  01411 025404      JMP IFIX1      NO
0139  01412 035364      ISZ IFIX       YES
0140  01413 125364      JMP IFIX,I
0141  01414 061614 IFIX3 LDA GETCR     RETRIEVE (A)
0142  01415 002120      CLE,SSA        TRUNCATE
0143  01416 003401      CCA,RSS        TO
0144  01417 002401      CLA,RSS        -1
0145  01420 007401      CCB,RSS        OR
0146  01421 006400      CLB           0
0147  01422 025412      JMP IFIX2+2

```

0149\*\*

0150\*\*\* TAKE ARITHMETIC INVERSE \*\*

0151\*\*

|      |       |        |       |             |                              |
|------|-------|--------|-------|-------------|------------------------------|
| 0152 | 01423 | 000000 | ARINV | NOP         | NUMBER IN (A) AND (B)        |
| 0153 | 01424 | 071677 |       | STA OUTLN   | SWAP                         |
| 0154 | 01425 | 060001 |       | LDA 1       |                              |
| 0155 | 01426 | 065677 |       | LDB OUTLN   | REGISTERS                    |
| 0156 | 01427 | 007100 |       | CMB,CLE     | COMPLEMENT HIGH PART         |
| 0157 | 01430 | 020460 |       | XOR M256    | COMPLEMENT LOW PART          |
| 0158 | 01431 | 040377 |       | ADA B400    | ADD IN 1                     |
| 0159 | 01432 | 002041 |       | SEZ,RSS     | OVERFLOW?                    |
| 0160 | 01433 | 025452 |       | JMP ARIN2   | NO                           |
| 0161 | 01434 | 006004 |       | INB         | YES, INCREMENT HIGH MANTISSA |
| 0162 | 01435 | 054470 |       | CPB FLG0T   | OVERFLOW?                    |
| 0163 | 01436 | 025442 |       | JMP ARIN1   | YES                          |
| 0164 | 01437 | 054427 |       | CPB UNNRM   | NO, NEGATIVE UNNORMALIZED?   |
| 0165 | 01440 | 002001 |       | RSS         | YES                          |
| 0166 | 01441 | 025452 |       | JMP ARIN2   | NO                           |
| 0167 | 01442 | 044427 | ARIN1 | ADB UNNRM   | FIX HIGH MANTISSA            |
| 0168 | 01443 | 000033 |       | SLA,RAR     | POSITION EXPONENT            |
| 0169 | 01444 | 030421 |       | IOR MSK4    | FILL IN BITS IF NEGATIVE     |
| 0170 | 01445 | 006021 |       | SSB,RSS     | POSITIVE?                    |
| 0171 | 01446 | 002005 |       | INA,RSS     | YES, BUMP EXPONENT           |
| 0172 | 01447 | 040431 |       | ADA M1      | NO, DECREMENT EXPONENT       |
| 0173 | 01450 | 001200 |       | RAL         | POSITION                     |
| 0174 | 01451 | 010376 |       | AND MSK0    | EXPONENT                     |
| 0175 | 01452 | 071677 | ARIN2 | STA OUTLN   | SWAP                         |
| 0176 | 01453 | 060001 |       | LDA 1       |                              |
| 0177 | 01454 | 065677 |       | LDB OUTLN   | REGISTERS                    |
| 0178 | 01455 | 125423 |       | JMP ARINV,I |                              |

0179\*\*

0180\*\*\* UNPACK LOW WORD OF NUMBER \*\*

0181\*\*

|      |       |        |       |             |                           |
|------|-------|--------|-------|-------------|---------------------------|
| 0182 | 01456 | 000000 | .FLUN | NOP         | WORD IN (B)               |
| 0183 | 01457 | 060001 |       | LDA 1       | (A) = (B)                 |
| 0184 | 01460 | 010376 |       | AND MSK0    | EXTRACT EXPONENT IN (A)   |
| 0185 | 01461 | 007000 |       | CMB         | SUBTRACT OFF              |
| 0186 | 01462 | 044000 |       | ADB 0       | EXPONENT FROM             |
| 0187 | 01463 | 007000 |       | CMB         | MANTISSA IN (B)           |
| 0188 | 01464 | 000033 |       | SLA,RAR     | NEGATIVE EXPONENT?        |
| 0189 | 01465 | 030421 |       | IOR MSK4    | YES, FILL IN LEADING BITS |
| 0190 | 01466 | 125456 |       | JMP .FLUN,I | NO                        |

0191\*\*

0192\*\*\* STACK (B) ON LOW-CORE STACK \*\*

0193\*\*

|      |       |        |       |             |                 |
|------|-------|--------|-------|-------------|-----------------|
| 0194 | 01467 | 000000 | SLWST | NOP         |                 |
| 0195 | 01470 | 034141 |       | ISZ LSTPT   | ADVANCE 'LOW    |
| 0196 | 01471 | 060141 |       | LDA LSTPT   | STACK' POINTER  |
| 0197 | 01472 | 050142 |       | CPA HSTPT   | STACK OVERFLOW? |
| 0198 | 01473 | 014477 | E1    | JSB ERROR   | YES             |
| 0199 | 01474 | 174141 |       | STB LSTPT,I | NO, STACK (B)   |
| 0200 | 01475 | 125467 |       | JMP SLWST,I |                 |

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0202\*\*

0203\*\*\* BUMP HIGH STACK POINTER \*\*

0204\*\*

|      |       |        |       |             |           |
|------|-------|--------|-------|-------------|-----------|
| 0205 | 01476 | 000000 | BHSTP | NOP         |           |
| 0206 | 01477 | 007400 |       | CCB         | ADVANCE   |
| 0207 | 01500 | 044142 |       | ADB HSTPT   |           |
| 0208 | 01501 | 074142 |       | STB HSTPT   | POINTER   |
| 0209 | 01502 | 054141 |       | CPB LSTPT   | OVERFLOW? |
| 0210 | 01503 | 025473 |       | JMP E1      | YES       |
| 0211 | 01504 | 125476 |       | JMP BHSTP,I | NO        |

0212\*\*

0213\*\*\* FETCH TOP OF STACK \*\*

0214\*\*

|      |       |        |       |             |          |
|------|-------|--------|-------|-------------|----------|
| 0215 | 01505 | 000000 | STTOP | NOP         |          |
| 0216 | 01506 | 015515 |       | JSB OPCHK   | VALIDATE |
| 0217 | 01507 | 015536 |       | JSB RSCHK   | OPERAND  |
| 0218 | 01510 | 164142 |       | LDB HSTPT,I | SAVE     |
| 0219 | 01511 | 160001 |       | LDA 1,I     | LOAD     |
| 0220 | 01512 | 006004 |       | INB         |          |
| 0221 | 01513 | 164001 |       | LDB 1,I     | NUMBER   |
| 0222 | 01514 | 125505 |       | JMP STTOP,I |          |

0223\*\*

0224\*\*\* VERIFY LEGITIMACY OF OPERAND \*\*

0225\*\*

|      |       |        |       |             |                          |
|------|-------|--------|-------|-------------|--------------------------|
| 0226 | 01515 | 000000 | OPCHK | NOP         |                          |
| 0227 | 01516 | 164142 |       | LDB HSTPT,I | OPERAND ADDRESS TO (B)   |
| 0228 | 01517 | 160001 |       | LDA 1,I     | HIGH PART OF             |
| 0229 | 01520 | 050470 |       | CPA MNEG    | OPERAND 100000B?         |
| 0230 | 01521 | 006005 |       | INB,RSS     | YES                      |
| 0231 | 01522 | 025527 |       | JMP OPCH1   | NO                       |
| 0232 | 01523 | 160001 |       | LDA 1,I     | LOW PART                 |
| 0233 | 01524 | 050471 |       | CPA MNEG+1  | 776B?                    |
| 0234 | 01525 | 014477 |       | JSB ERROR   | YES                      |
| 0235 | 01526 | 044431 | E8    | ADB M1      |                          |
| 0236 | 01527 | 054140 | OPCH1 | CPB TSTPT   | TEMPORARY OPERAND?       |
| 0237 | 01530 | 002001 |       | RSS         | YES                      |
| 0238 | 01531 | 125515 |       | JMP OPCHK,I | NO                       |
| 0239 | 01532 | 060140 |       | LDA TSTPT   | UNSTACK                  |
| 0240 | 01533 | 040432 |       | ADA M2      | THE TEMPORARY            |
| 0241 | 01534 | 070140 |       | STA TSTPT   | OPERAND                  |
| 0242 | 01535 | 125515 |       | JMP OPCHK,I | EXIT WITH ADDRESS IN (B) |

0243\*\*

0244\*\*\* ALLOT SPACE FOR INTERMEDIATE RESULT \*\*

0245\*\*

|      |       |        |       |             |                 |
|------|-------|--------|-------|-------------|-----------------|
| 0246 | 01536 | 000000 | RSCHK | NOP         |                 |
| 0247 | 01537 | 060140 |       | LDA TSTPT   | ALLOT           |
| 0248 | 01540 | 040325 |       | ADA .2      |                 |
| 0249 | 01541 | 070140 |       | STA TSTPT   | SPACE           |
| 0250 | 01542 | 040431 |       | ADA M1      | OVERFLOW INTO   |
| 0251 | 01543 | 050120 |       | CPA LSTAK   | LOW-CORE STACK? |
| 0252 | 01544 | 002001 |       | RSS         | YES             |
| 0253 | 01545 | 125536 |       | JMP RSCHK,I | NO              |
| 0254 | 01546 | 060120 |       | LDA LSTAK   | SAVE            |
| 0255 | 01547 | 002004 |       | INA         | LOWER           |
| 0256 | 01550 | 070163 |       | STA TEMP3   | STACK BOUND     |
| 0257 | 01551 | 040333 |       | ADA .9      | UPDATE          |

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|   |       |        |              |                                 |
|---|-------|--------|--------------|---------------------------------|
| 0258  | 01552 | 070120 | STA LSTAK    | STACK BOTTOM                    |
| 0259  | 01553 | 060141 | LDA LSTPT    | SET                             |
| 0260  | 01554 | 002004 | INA          | SOURCE                          |
| 0261  | 01555 | 070162 | STA TEMP2    | ADDRESS                         |
| 0262  | 01556 | 040333 | ADA .9       | UPDATE                          |
| 0263  | 01557 | 070141 | STA LSTPT    | STACK TOP                       |
| 0264  | 01560 | 002004 | INA          | SET DESTINATION                 |
| 0265  | 01561 | 070164 | STA TEMP4    | ADDRESS                         |
| 0266  | 01562 | 003004 | CMA, INA     | OVERFLOW                        |
| 0267  | 01563 | 040142 | ADA HSTPT    | INTO                            |
| 0268  | 01564 | 002020 | SSA          | HIGH-CORE STACK?                |
| 0269  | 01565 | 025473 | JMP E1       | YES                             |
| 0270  | 01566 | 014554 | JSB MVTOH    | NO, MOVE                        |
| 0271  | 01567 | 125536 | JMP RSCHK, I | LOW-CORE STACK                  |
| 0272**  |       |        |              |                                 |
| 0273*** CHECK FOR DIGIT **                          |       |        |              |                                 |
| 0274**  |       |        |              |                                 |
| 0275  | 01570 | 000000 | DIGCK NOP    | CHARACTER IN (A)                |
| 0276  | 01571 | 064000 | LDB 0        |                                 |
| 0277  | 01572 | 044452 | ADB D72      | ASCII 72B                       |
| 0278  | 01573 | 006021 | SSB, R8S     | OR GREATER?                     |
| 0279  | 01574 | 125570 | JMP DIGCK, I | YES, RETURN WITH CHARACTER      |
| 0280  | 01575 | 044334 | ADB .10      | NO, ASCII 60B                   |
| 0281  | 01576 | 006020 | SSB          | OR GREATER?                     |
| 0282  | 01577 | 125570 | JMP DIGCK, I | NO                              |
| 0283  | 01600 | 035570 | ISZ DIGCK    | YES, SET 'SUCCESS' EXIT,        |
| 0284  | 01601 | 060001 | LDA 1        | LOAD DIGIT INTO (A),            |
| 0285  | 01602 | 125570 | JMP DIGCK, I | AND RETURN                      |
| 0286**  |       |        |              |                                 |
| 0287*** CHECK FOR LETTER **                         |       |        |              |                                 |
| 0288**  |       |        |              |                                 |
| 0289  | 01603 | 000000 | LETCK NOP    | CHARACTER IN (A)                |
| 0290  | 01604 | 064000 | LDB 0        |                                 |
| 0291  | 01605 | 044457 | ADB D133     | ASCII 133B                      |
| 0292  | 01606 | 006021 | SSB, R8S     | OR GREATER?                     |
| 0293  | 01607 | 125603 | JMP LETCK, I | YES, EXIT WITH CHARACTER IN (A) |
| 0294  | 01610 | 044340 | ADB .26      | NO, ASCII 101B                  |
| 0295  | 01611 | 006021 | SSB, R8S     | OR GREATER?                     |
| 0296  | 01612 | 035603 | ISZ LETCK    | YES                             |
| 0297  | 01613 | 125603 | JMP LETCK, I | NO                              |
| 0298*   |       |        |              |                                 |
| 0299* ON END-OF-FILE CONDITION RETURN TO P+1 ELSE   |       |        |              |                                 |
| 0300* RETURN TO P+2 WITH NON-BLANK CHARACTER IN (A) |       |        |              |                                 |
| 0301*   |       |        |              |                                 |
| 0302  | 01614 | 000000 | GETCR NOP    |                                 |
| 0303  | 01615 | 034133 | ISZ CCNT     | ANY CHARACTERS LEFT?            |
| 0304  | 01616 | 002001 | R8S          |                                 |
| 0305  | 01617 | 125614 | JMP GETCR, I | NO, END-OF-FILE EXIT            |
| 0306  | 01620 | 064132 | LDB BADDR    | LOAD BUFFER ADDRESS             |
| 0307  | 01621 | 034132 | ISZ BADDR    | UPDATE FOR NEXT TIME            |
| 0308  | 01622 | 004065 | CLE, ERB     | SET CHARACTER FLAG              |
| 0309  | 01623 | 160001 | LDA 1, I     | LOAD CURRENT BUFFER WORD        |
| 0310  | 01624 | 002041 | SEZ, R8S     | FIRST CHARACTER?                |
| 0311  | 01625 | 001727 | ALF, ALF     | YES, POSITION IT                |
| 0312  | 01626 | 010374 | AND B177     | MASK EXTRANEIOUS BITS           |
| 0313  | 01627 | 050476 | CPA BLANK    | BLANK?                          |

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|   |       |        |               |                           |
|---|-------|--------|---------------|---------------------------|
| 0314                                    | 01630 | 025615 | JMP GETCR+1   | YES, FETCH NEXT CHARACTER |
| 0315                                    | 01631 | 035614 | ISZ GETCR     | UPDATE RETURN ADDRESS     |
| 0316                                    | 01632 | 125614 | JMP GETCR,I   | AND EXIT                  |
| 0317**                                  |       |        |               |                           |
| 0318*** BACKSPACE OVER ONE CHARACTER ** |       |        |               |                           |
| 0319**                                  |       |        |               |                           |
| 0320                                    | 01633 | 000000 | BCKSP NOP     |                           |
| 0321                                    | 01634 | 003400 | CCA           | BACKSPACE                 |
| 0322                                    | 01635 | 040133 | ADA CCNT      | OVER                      |
| 0323                                    | 01636 | 070133 | STA CCNT      | LAST                      |
| 0324                                    | 01637 | 003400 | CCA           | CHARACTER IN              |
| 0325                                    | 01640 | 040132 | ADA BADDR     | INPUT                     |
| 0326                                    | 01641 | 070132 | STA BADDR     | BUFFER                    |
| 0327                                    | 01642 | 125633 | JMP BCKSP,I   |                           |
| 0328**                                  |       |        |               |                           |
| 0329*** PRINT A NUMBER **               |       |        |               |                           |
| 0330**                                  |       |        |               |                           |
| 0331                                    | 01643 | 000000 | ENOUT NOP     |                           |
| 0332                                    | 01644 | 002300 | CCE           | SET SIGN FLAG TRUE        |
| 0333                                    | 01645 | 114220 | JSB NUMOA,I   | OUTPUT THE NUMBER         |
| 0334                                    | 01646 | 015677 | JSB OUTLN     | END-OF-LINE ACTION        |
| 0335                                    | 01647 | 060345 | LDA .32       | OUTPUT                    |
| 0336                                    | 01650 | 015715 | JSB OUTCR     | A BLANK                   |
| 0337                                    | 01651 | 064172 | LDB MLBX1+1   | FIELD                     |
| 0338                                    | 01652 | 044133 | ADB CCNT      |                           |
| 0339                                    | 01653 | 006002 | SZB           | FULL?                     |
| 0340                                    | 01654 | 025647 | JMP *-5       | NO                        |
| 0341                                    | 01655 | 125643 | JMP ENOUT,I   |                           |
| 0342**                                  |       |        |               |                           |
| 0343*** SPACE FOR A COMMA **            |       |        |               |                           |
| 0344**                                  |       |        |               |                           |
| 0345                                    | 01656 | 000000 | EDELM NOP     |                           |
| 0346                                    | 01657 | 064133 | LDB CCNT      | NO, LOAD CHARACTER COUNT  |
| 0347                                    | 01660 | 006003 | EDEL1 SZB,RSS | ZERO?                     |
| 0348                                    | 01661 | 125656 | JMP EDELM,I   | YES                       |
| 0349                                    | 01662 | 044444 | ADB M15       | NO, SUBTRACT ZONE WIDTH   |
| 0350                                    | 01663 | 006021 | SSB,RSS       | NEGATIVE RESULT?          |
| 0351                                    | 01664 | 025660 | JMP EDEL1     | NO                        |
| 0352                                    | 01665 | 075677 | STB OUTLN     | YES, SAVE BLANK COUNT     |
| 0353                                    | 01666 | 060345 | LDA .32       | FETCH BLANK               |
| 0354                                    | 01667 | 015715 | JSB OUTCR     | OUTPUT                    |
| 0355                                    | 01670 | 035677 | ISZ OUTLN     |                           |
| 0356                                    | 01671 | 025666 | JMP *-3       | BLANKS                    |
| 0357                                    | 01672 | 064133 | LDB CCNT      | LINE                      |
| 0358                                    | 01673 | 044456 | ADB M76       |                           |
| 0359                                    | 01674 | 006021 | SSB,RSS       | FULL?                     |
| 0360                                    | 01675 | 015677 | JSB OUTLN     | YES                       |
| 0361                                    | 01676 | 125656 | JMP EDELM,I   |                           |

0363\*\*

0364\*\*\* OUTPUT A COMPLETED LINE \*\*

0365\*\*

|      |       |        |       |             |                                  |
|------|-------|--------|-------|-------------|----------------------------------|
| 0366 | 01677 | 000000 | OUTLN | NOP         |                                  |
| 0367 | 01700 | 060146 |       | LDA TYPE    | FETCH 'CHARACTERS PRINTED' COUNT |
| 0368 | 01701 | 000010 |       | SLA         | CORRECT FOR START ON             |
| 0369 | 01702 | 002004 |       | INA         | ODD PRINT POSITION               |
| 0370 | 01703 | 040133 |       | ADA CCNT    | OUTPUT                           |
| 0371 | 01704 | 064131 |       | LDB ,BUFA   | A                                |
| 0372 | 01705 | 114102 |       | JSB WRITE,I | LINE                             |
| 0373 | 01706 | 064172 |       | LDB MLBX1+1 | CORRECT                          |
| 0374 | 01707 | 044133 |       | ADB CCNT    |                                  |
| 0375 | 01710 | 074172 |       | STB MLBX1+1 | MARKER                           |
| 0376 | 01711 | 002400 |       | CLA         | RESET COUNT OF                   |
| 0377 | 01712 | 070146 |       | STA TYPE    | CHARACTERS PRINTED               |
| 0378 | 01713 | 114250 |       | JSB PRNIA,I | CLEAN UP                         |
| 0379 | 01714 | 125677 |       | JMP OUTLN,I |                                  |

0380\*\*

0381\*\*\* ADD A CHARACTER TO OUTPUT BUFFER \*\*

0382\*\*

|      |       |        |       |             |                         |
|------|-------|--------|-------|-------------|-------------------------|
| 0383 | 01715 | 000000 | OUTCR | NOP         | CHARACTER IN (A)        |
| 0384 | 01716 | 071364 |       | STA IFIX    | SAVE CHARACTER          |
| 0385 | 01717 | 034133 |       | ISZ CCNT    | COUNT IT                |
| 0386 | 01720 | 064133 |       | LDB CCNT    | FIRST CHARACTER         |
| 0387 | 01721 | 004010 |       | SLB         | OF BUFFER WORD?         |
| 0388 | 01722 | 034132 |       | ISZ BADDR   | YES, MOVE TO FRESH WORD |
| 0389 | 01723 | 160132 |       | LDA BADDR,I | LOAD BUFFER WORD        |
| 0390 | 01724 | 004010 |       | SLB         | SAVE                    |
| 0391 | 01725 | 001727 |       | ALF,ALF     | OTHER                   |
| 0392 | 01726 | 010460 |       | AND M256    | CHARACTER               |
| 0393 | 01727 | 031364 |       | IOR IFIX    | ADD NEW CHARACTER       |
| 0394 | 01730 | 004010 |       | SLB         | POSITION                |
| 0395 | 01731 | 001727 |       | ALF,ALF     | WORD AND                |
| 0396 | 01732 | 170132 |       | STA BADDR,I | STORE IT                |
| 0397 | 01733 | 125715 |       | JMP OUTCR,I |                         |

3058\*

0399\*

|      |       |       |     |         |
|------|-------|-------|-----|---------|
| 0400 | 00160 | TEMP  | EQU | TEMPS+1 |
| 0401 | 00161 | TEMP1 | EQU | TEMPS+2 |
| 0402 | 00162 | TEMP2 | EQU | TEMPS+3 |
| 0403 | 00163 | TEMP3 | EQU | TEMPS+4 |
| 0404 | 00164 | TEMP4 | EQU | TEMPS+5 |
| 0405 | 00165 | COLNT | EQU | TEMPS+6 |
| 0406 | 00163 | STEMP | EQU | TEMPS+4 |
| 0407 | 01274 | MANT1 | EQU | SYMCK   |
| 0408 | 01336 | MANT2 | EQU | MDIM    |
| 0409 | 01603 | EXPON | EQU | LETCK   |
| 0410 | 01633 | DPFLG | EQU | BCKSP   |
| 0411 | 01715 | ARYAD | EQU | OUTCR   |
| 0412 | 00567 | EOL   | EQU | CONST   |
| 0413 | 01734 | FINBP | EQU | *       |

FIRST UNUSED WORD OF BASE PAGE

BASIC INTERPRETER CONTROL  
CHECK SYNTAX AND TRANSLITERATE





PAGE 0041 #02 BASIC INTEPRETER CONTROL

|       |                                  |        |       |             |                                  |
|-------|----------------------------------|--------|-------|-------------|----------------------------------|
| 0470  | 02046                            | 066004 | DATAI | LDB LFEED   | LOAD ADDRESS OF LINE FEED        |
| 0471  | 02047                            | 074152 |       | STB RSYM    | STORE ADDRESS OF READY SYMBOL    |
| 0472  | 02050                            | 060137 |       | LDA TTYFL   | TTY TAPE                         |
| 0473  | 02051                            | 002002 |       | SZA         | INPUT?                           |
| 0474  | 02052                            | 026056 |       | JMP GTRCD   | YES, SUPPRESS LINE FEED          |
| 0475  | 02053                            | 003400 |       | CCA         | NO                               |
| 0476  | 02054                            | 064152 |       | LDB RSYM    | LOAD LF OR '?' ADDRESS           |
| 0477  | 02055                            | 114102 |       | JSB WRITE,I | PRINT LF OR '?', NO CR-LF        |
| 0478* |                                  |        |       |             |                                  |
| 0479  | 02056                            | 114123 | GTRCD | JSB IMOFF,I | TURN OFF KEYBOARD INTERRUPT MODE |
| 0480  | 02057                            | 060366 |       | LDA .72     |                                  |
| 0481  | 02060                            | 064131 |       | LDB .BUFA   |                                  |
| 0482  | 02061                            | 114104 |       | JSB REED,I  | GET RECORD FROM TTY              |
| 0483  | 02062                            | 050432 |       | CPA M2      |                                  |
| 0484  | 02063                            | 026115 |       | JMP RBOU    | RUBOUT IN RECORD, INPUT AGAIN    |
| 0485* |                                  |        |       |             |                                  |
| 0486  | 02064                            | 003021 | RPRCS | CMA,SSA,RSS | SET A=-1-# CHARS AND CHECK FOR   |
| 0487  | 02065                            | 014477 |       | JSB ERROR   | RECORD TOO LONG                  |
| 0488  | 02066                            | 070133 | RTLE  | STA CCNT    | -1-# CHARACTERS < 0,SET CCNT     |
| 0489  | 02067                            | 060131 |       | LDA .BUFA   | LOAD BUFFER ADDRESS              |
| 0490  | 02070                            | 000066 |       | CLE,ELA     | SHIFT LEFT,LEAST BIT USED AS     |
| 0491  | 02071                            | 070132 |       | STA BADDR   | ODD/EVEN FLAG                    |
| 0492  | 02072                            | 015614 |       | JSB GETCR   | FETCH FIRST CHARACTER            |
| 0493  | 02073                            | 026046 |       | JMP DATAI   | NULL RECORD, INPUT AGAIN         |
| 0494  | 02074                            | 066121 |       | LDB DRQST   |                                  |
| 0495  | 02075                            | 006003 |       | SZB,RSS     | DATA REQUEST?                    |
| 0496  | 02076                            | 026126 |       | JMP CKRCD   | NO DATA REQUEST,GO CHECK RECORD  |
| 0497  | 02077                            | 050372 |       | CPA 8       | ASCII 8 FIRST CHARACTER?         |
| 0498  | 02100                            | 016200 |       | JSB STOP    | ASSUME STOP REQUESTED            |
| 0499  | 02101                            | 002400 |       | CLA         | LINE                             |
| 0500  | 02102                            | 114102 |       | JSB WRITE,I | FEED                             |
| 0501  | 02103                            | 015633 |       | JSB BCKSP   | BACKSPACE                        |
| 0502  | 02104                            | 060426 |       | LDA RMODE   | RETURN TO                        |
| 0503  | 02105                            | 070127 |       | STA LISTR   | RUN MODE                         |
| 0504  | 02106                            | 066121 |       | LDB DRQST   |                                  |
| 0505  | 02107                            | 002400 |       | CLA         |                                  |
| 0506  | 02110                            | 072121 |       | STA DRQST   | CLEAR DATA REQUEST FLAG          |
| 0507  | 02111                            | 114124 |       | JSB IMON,I  | DATA REQUEST,TURN ON INTRPT MODE |
| 0508  | 02112                            | 124001 |       | JMP 1,I     | GO TO DATA REQUEST CALLING POINT |
| 0509* |                                  |        |       |             |                                  |
| 0510  | 02113                            | 056040 |       | ASC 1,\     |                                  |
| 0511  | 02114                            | 002113 |       | DEF *-1     |                                  |
| 0512  | 02115                            | 066114 | RBOU  | LDB *-1     | OUTPUT '\ ' WITH                 |
| 0513  | 02116                            | 002404 |       | CLA,INA     | CARRIAGE RETURN                  |
| 0514  | 02117                            | 114102 |       | JSB WRITE,I | AND LINE FEED                    |
| 0515  | 02120                            | 026056 |       | JMP GTRCD   |                                  |
| 0516* |                                  |        |       |             |                                  |
| 0517* | THIS SECTION REQUESTS DATA INPUT |        |       |             |                                  |
| 0518* |                                  |        |       |             |                                  |
| 0519  | 02121                            | 000000 | DRGST | NOP         | EXIT/ENTRY AND FLAG              |
| 0520  | 02122                            | 064130 |       | LDB TLSTR   | SHIFT TO                         |
| 0521  | 02123                            | 074127 |       | STB LISTR   | COMMAND MODE                     |
| 0522  | 02124                            | 066005 |       | LDB QMRKA   |                                  |
| 0523  | 02125                            | 026047 |       | JMP DATAI+1 | PRINT '?' AND WAIT               |

0525\*

0526\* THIS SECTION CHECKS RECORD FOR SYSTEM COMMANDS.

0527\*

|      |       |        |       |     |         |                                  |
|------|-------|--------|-------|-----|---------|----------------------------------|
| 0528 | 02126 | 064134 | CKRCD | LDB | SBUFA   |                                  |
| 0529 | 02127 | 074135 |       | STB | SBPTR   | INITIALIZE SYNTAX BUFFER POINTER |
| 0530 | 02130 | 170135 |       | STA | SBPTR,I | PUT FIRST CHAR IN SYNTAX BUFFER  |
| 0531 | 02131 | 015603 |       | JSB | LETCK   | IS CHARACTER A LETTER            |
| 0532 | 02132 | 026220 |       | JMP | SYNTAX  | NO, TRY SYNTAX                   |

0533\*

|      |       |        |  |     |         |                                 |
|------|-------|--------|--|-----|---------|---------------------------------|
| 0534 | 02133 | 060306 |  | LDA | TBLAD   | LOAD SYS CMND TABLE START POINT |
| 0535 | 02134 | 064440 |  | LDB | M8      | LOOK FOR A                      |
| 0536 | 02135 | 114212 |  | JSB | TSRCH,I | SYSTEM COMMAND                  |
| 0537 | 02136 | 014477 |  | JSB | ERROR   | NOT A VALID COMMAND             |

0538\*

|      |       |  |       |     |   |                              |
|------|-------|--|-------|-----|---|------------------------------|
| 0539 | 02137 |  | INVSC | EQU | * | INVALID CMND ERROR REFERENCE |
|------|-------|--|-------|-----|---|------------------------------|

0540\*

|      |       |        |  |         |         |                                  |
|------|-------|--------|--|---------|---------|----------------------------------|
| 0541 | 02137 | 001727 |  | ALF,ALF |         | ENTRY FOUND                      |
| 0542 | 02140 | 001100 |  | AR8     |         | MOVE JMP ADDR TO LEAST BITS POS. |
| 0543 | 02141 | 042007 |  | ADA     | CMNDA   | ADD START ADDR. OF CMND ROUTINES |
| 0544 | 02142 | 072200 |  | STA     | STOP    | SAVE (A)                         |
| 0545 | 02143 | 002400 |  | CLA     |         | OUTPUT                           |
| 0546 | 02144 | 114102 |  | JSB     | WRITE,I | A CR-LF                          |
| 0547 | 02145 | 126200 |  | JMP     | STOP,I  | EXECUTE COMMAND                  |

# PAGE 0043 #02 BASIC INTEPRETER CONTROL

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0549*
0550*   THIS SETS UP AND EXECUTES THE SYSTEM COMMANDS
0551*
0552   02146          CMADS EQU *          COMMAND LIST REFERENCE
0553*
0554   02146 114124   RUN   JSB IMON,I      TURN ON TTY INTERRUPT MODE
0555   02147 124202          JMP RUNA,I     GO TO RUN ENTRY POINT
0556*
0557   02150 026020   SCRTM JMP FLUSH      SCRATCH CURRENT PROGRAM
0558*
0559   02151 060130   TLIST LDA TLSTR      LIST PROGRAM, TFLAG = 0
0560   02152 006401          CLB,RSS
0561*
0562   02153 060126   PLIST LDA PLSTR      PUNCH PROGRAM, TFLAG # 0
0563   02154 070127          STA LISTR      SET DRIVER ADDRESS
0564   02155 074136          STB TFLAG      SET DEVICE FLAG
0565   02156 114124   JSB IMON,I      TURN ON TTY INTERRUPT MODE
0566   02157 124207          JMP LISTA,I    GO TO LIST ENTRY POINT
0567*
0568   02160 114124   PTAPE JSB IMON,I     PTAPE COMMAND
0569   02161 060366          LDA .72
0570   02162 064131          LDB .BUFA
0571   02163 114101   JSB PREAD,I      GET RECORD FROM PHOTO READER
0572   02164 050432   CPA M2           END OF TAPE?
0573   02165 026174   JMP EOTR        YES,GO SEE IF START OR END
0574   02166 050433   CPA M3           PHOTO READER READY?
0575   02167 014477   JSB ERROR        NO
0576   02170 002003   PRERR SZA,RSS     YES
0577   02171 026161   JMP PTAPE+1     NULL RECORD
0578   02172 070136   STA TFLAG       SET FLAG # 0
0579   02173 026064   JMP RPRCS       GO PROCESS RECORD
0580*
0581   02174 064136   EOTR  LDB TFLAG
0582   02175 006003   SZB,RSS          START OR END OF TAPE?
0583   02176 026161   JMP PTAPE+1     START
0584   02177 026027   JMP RDYPT       GO TO READY POINT
0585*
0586*   STOP COMMAND SERVICE
0587*
0588   02200 000000   STOP  NOP
0589   02201 114123   JSB IMOFF,I      TURN OFF KEYBOARD INTERRUPT MODE
0590   02202 064130   LDB TLSTR        SHIFT TO
0591   02203 074127   STB LISTR        COMMAND MODE
0592   02204 060470   LDA MNEG
0593   02205 002006   INA,SZA
0594   02206 026205   JMP *-1          DELAY FOR 100 MILLISECONDS
0595   02207 114102   JSB WRITE,I      CARRIAGE-RETURN LINE-FEED
0596   02210 060327   LDA .4
0597   02211 066006   LDB STOPA
0598   02212 114102   JSB WRITE,I      PRINT "STOP"
0599   02213 026027   JMP RDYPT

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```
0601*
0602** SET LINE FEED SUPPRESSION
0603*
0604 02214 070137 TAPE STA TTYFL SET TO 'TAPE' MODE
0605 02215 026056 JMP 0TRCD
0606*
0607** RETURN TO 'BOSS' EXECUTIVE
0608*
0609 02216 002400 BYEC CLA
0610 02217 024077 JMP 77B
```

# PAGE 0045 #03 CHECK SYNTAX AND TRANSLITERATE

```

0002*
0003* *****
0004****
0005*** CHECK SYNTAX OF STATEMENT ***
0006****
0007* *****
0008*
0009**
0010*** DETERMINE SEQUENCE NUMBER **
0011**
0012 02220 114216 SYNTAX JSB INCHK,I RECORD
0013 02221 000463 DEF MAXSN SEQUENCE NUMBER
0014 02222 034135 ISZ SBPTR SAVE SPACE FOR LENGTH WORD
0015 02223 074145 STB .LNUM SAVE LINE NUMBER
0016 02224 064134 LDB SBUFA SET
0017 02225 006004 INB TEMP TO
0018 02226 074160 STB TEMP (SBUFA)+1
0019**
0020*** DETERMINE STATEMENT TYPE **
0021**
0022 02227 050334 CPA .10 NULL STATEMENT?
0023 02230 124253 JMP DELST,I YES, DELETE IT
0024 02231 170135 STA SBPTR,I NO, RECORD NEXT CHARACTER
0025 02232 060307 LDA STTYP PRINT-TABLE ADDRESS
0026 02233 064446 LDB M21 -(NUMBER OF ENTRIES)
0027 02234 114212 JSB TSEARCH,I FIND STATEMENT TYPE
0028 02235 014477 JSB ERROR NOT FOUND
0029 02236 064441 SYNE1 LDB M9 SET MULTIPLE STORE
0030 02237 076330 STB MSFLG TO FALSE
0031 02240 064113 LDB PBPTR NULL
0032 02241 054112 CPB PBUFF PROGRAM?
0033 02242 002001 RSS YES
0034 02243 026247 JMP SYNT1 NO
0035 02244 064110 LDB FWAM INSURE NO
0036 02245 074112 STB PBUFF SPURIOUS COMMON
0037 02246 074113 STB PBPTR EXISTS
0038 02247 074157 SYNT1 STB TEMPS SET S-STACK POINTER
0039 02250 006400 CLB SET DEFINE FLAG
0040 02251 076332 STB DFLAG TO FALSE
0041 02252 076334 STB PFLAG SET PARAMETER FLAG TO FALSE
0042 02253 001727 ALF,ALF COMPUTE
0043 02254 001300 RAR ADDRESS OF
0044 02255 040302 ADA STBAS SYNTAX ROUTINE AND
0045 02256 124000 JMP 0,I BRANCH TO IT
0046**
0047*** SINGLE CHARACTER AND/OR FORMULA OPERATORS **
0048**
0049 02257 001000 QUOTE OCT 1000 BITS 15-9 OF THE LABELLED WORD
0050 02260 021040 ASC 1," ARE THE BASIC CODE OPERATOR
0051 02261 002000 COMMA OCT 2000
0052 02262 026040 ASC 1,, NUMBERS. BITS 3-0 ARE THE
0053 02263 003000 SMCLN OCT 3000
0054 02264 035440 ASC 1,, OPERATOR'S HIERARCHICAL
0055 02265 004001 RPARN OCT 4001
0056 02266 024440 ASC 1,) PRECEDENCE FOR THOSE OPERATORS
0057 02267 005001 RBRAC OCT 5001

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|         |       |                      |       |           |                                 |
|---------|-------|----------------------|-------|-----------|---------------------------------|
| 0058    | 02270 | 056440               | ASC   | 1,1       |                                 |
| 0059    | 02271 | 006002               | SCMMA | OCT 6002  | BELONGING TO FORMULAS. THE      |
| 0060    | 02272 | 026040               | ASC   | 1,,       |                                 |
| 0061    | 02273 | 007002               | ASSOP | OCT 7002  | UNLABELLED WORD GIVES THE       |
| 0062    | 02274 | 036440               | ASC   | 1,=       |                                 |
| 0063    | 02275 | 010007               | PLLS  | OCT 10007 | ASCII REPRESENTATION OF THE     |
| 0064    | 02276 | 025440               | ASC   | 1,+       |                                 |
| 0065    | 02277 | 011007               | MINUS | OCT 11007 | SINGLE CHARACTER OPERATORS.     |
| 0066    | 02300 | 026440               | ASC   | 1,-       |                                 |
| 0067    | 02301 | 012010               | TIMES | OCT 12010 |                                 |
| 0068    | 02302 | 025040               | ASC   | 1,*       |                                 |
| 0069    | 02303 | 013010               | DIV   | OCT 13010 |                                 |
| 0070    | 02304 | 027440               | ASC   | 1,/       |                                 |
| 0071    | 02305 | 014012               | EXPS  | OCT 14012 |                                 |
| 0072    | 02306 | 057040               | ASC   | 1,^       |                                 |
| 0073    | 02307 | 015005               | GTR   | OCT 15005 |                                 |
| 0074    | 02310 | 037040               | ASC   | 1,>       |                                 |
| 0075    | 02311 | 016005               | LSS   | OCT 16005 |                                 |
| 0076    | 02312 | 036040               | ASC   | 1,<       |                                 |
| 0077    | 02313 | 017005               | UNEQL | OCT 17005 |                                 |
| 0078    | 02314 | 021440               | ASC   | 1,#       |                                 |
| 0079    | 02315 | 020005               | EQUAL | OCT 20005 |                                 |
| 0080    | 02316 | 036440               | ASC   | 1,=       |                                 |
| 0081    | 02317 | 021011               | UNMIN | OCT 21011 |                                 |
| 0082    | 02320 | 026440               | ASC   | 1,-       |                                 |
| 0083    | 02321 | 022020               | LBRAC | OCT 22020 |                                 |
| 0084    | 02322 | 055440               | ASC   | 1,        |                                 |
| 0085    | 02323 | 023020               | LPARN | OCT 23020 |                                 |
| 0086    | 02324 | 024040               | ASC   | 1,        |                                 |
| 0087    | 02325 | 024011               | UPLUS | OCT 24011 |                                 |
| 0088    | 02326 | 025440               | ASC   | 1,+       |                                 |
| 0089    | 02327 | 025003               | ORCP  | OCT 25003 |                                 |
| 0090    | 02330 | 000000               | MSFLG | NOP       |                                 |
| 0091    | 02331 | 026004               | ANDOP | OCT 26004 |                                 |
| 0092    | 02332 | 000000               | DFLAG | NOP       |                                 |
| 0093    | 02333 | 027011               | NOTOP | OCT 27011 |                                 |
| 0094    | 02334 | 000000               | PFLAG | NOP       |                                 |
| 0095    | 02335 | 030005               | GTREQ | OCT 30005 |                                 |
| 0096    | 02336 | 000000               | UFLAG | NOP       |                                 |
| 0097    | 02337 | 031005               | LSSEQ | OCT 31005 |                                 |
| 0098*   |       |                      |       |           |                                 |
| 0099*** |       |                      |       |           |                                 |
| 0100**  | LET   | STATEMENT SYNTAX     | **    |           |                                 |
| 0101*** |       |                      |       |           |                                 |
| 0102*   |       |                      |       |           |                                 |
| 0103    | 02340 | 077530               | LETS  | STB SFLAG | SET 'NO STORE' FLAG ( (B) = 0 ) |
| 0104    | 02341 | 060440               | LDA   | M8        | SET MULTIPLE STORE FLAG         |
| 0105    | 02342 | 072330               | STA   | MSFLG     | TO TRUE                         |
| 0106    | 02343 | 017114               | JSB   | FSC       | FETCH FORMULA                   |
| 0107    | 02344 | 057530               | CPB   | SFLAG     | DID STORE OCCUR? ( (B)=0 )      |
| 0108    | 02345 | 014477               | JSB   | ERROR     | NO                              |
| 0109    | 02346 |                      | SYNE2 | EQU *     |                                 |
| 0110**  |       |                      |       |           |                                 |
| 0111*** | CHECK | FOR END OF STATEMENT | **    |           |                                 |
| 0112**  |       |                      |       |           |                                 |
| 0113    | 02346 | 050334               | EOST  | CPA .10   | END-OF-STATEMENT?               |

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|      |       |        |             |                       |
|------|-------|--------|-------------|-----------------------|
| 0114 | 02347 | 124252 | JMP ACCST,I | YES, ACCEPT STATEMENT |
| 0115 | 02350 | 024266 | JMP NOEOF   | NO, ILLEGAL CHARACTER |

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0117*
0118***
0119** DIM STATEMENT SYNTAX **
0120***
0121*
0122 02351 036332 DIMS ISZ DFLAG SET DFLAG TO TRUE
0123 02352 017530 JSB ARRYS CHECK AN ARRAY
0124 02353 124252 JMP ACCST,I DONE
0125 02354 026352 JMP DIMS+1 WAS A COMMA, CONTINUE
0126*
0127***
0128** COM STATEMENT SYNTAX **
0129***
0130*
0131 02355 064113 COMS LDB PBPTR HAS PROGRAM BUFFER
0132 02356 054110 CPB FWAM BEEN MOVED?
0133 02357 002001 RSS NO
0134 02360 014477 JSB ERROR YES, ILLEGAL COM
0135 02361 074166 SYNE3 STB TEMPS+7 SET ARRAY POINTER
0136 02362 036332 ISZ DFLAG SET DEFINE FLAG TO TRUE
0137 02363 003400 COMS1 CCA SET COMMON FLAG
0138 02364 072334 STA PFLAG TO TRUE
0139 02365 017530 JSB ARRYS CHECK AN ARRAY
0140 02366 002001 RSS DONE
0141 02367 026363 JMP COMS1 MORE ARRAYS
0142 02370 064166 LDB TEMPS+7 FETCH UPDATED POINTER
0143 02371 074112 STB PBUFF SET PROGRAM BUFFER ADDRESS
0144 02372 074113 STB PBPTR SET PROGRAM BUFFER POINTER
0145 02373 124252 JMP ACCST,I EXIT
0146*
0147***
0148** DEF STATEMENT SYNTAX **
0149***
0150*
0151 02374 017635 DEFS JSB LTR
0152 02375 026405 JMP SYNE4 FIRST
0153 02376 060161 LDA TEMP1
0154 02377 001727 ALF,ALF TWO CHARACTERS
0155 02400 030162 IOR TEMP2
0156 02401 050464 CPA FN 'FN'?
0157 02402 002001 RSS YES
0158 02403 026405 JMP SYNE4 NO
0159 02404 017635 JSB LTR LETTER FOLLOWS?
0160 02405 014477 SYNE4 JSB ERROR NO
0161 02406 060161 LDA TEMP1 YES, RECORD A
0162 02407 064361 LDB .58 FUNCTION
0163 02410 017650 JSB STROP NAME
0164 02411 060162 LDA TEMP2 RETRIEVE CHARACTER
0165 02412 017661 JSB LPCK LEFT PARENTHESIS?
0166 02413 030470 IOR FL0BT YES, SET FORMAL
0167 02414 170135 STA SBPTR,I PARAMETER BIT
0168 02415 017556 JSB VAROP FETCH SIMPLE VARIABLE
0169 02416 000000 NOP NONE FOUND
0170 02417 014477 JSB ERROR SUBSCRIPTED VARIABLE FOUND
0171 02420 017671 SYNE5 JSB RPCK RECORD A RIGHT PARENTHESIS
0172 02421 007400 CCB ASSIGNMENT

```



|         |                 |                  |       |             |                                  |
|---------|-----------------|------------------|-------|-------------|----------------------------------|
| 0173    | 02422           | 015274           |       | JSB SYMCK   |                                  |
| 0174    | 02423           | 002272           |       | DEF ASSOP-1 | OPERATOR?                        |
| 0175    | 02424           | 014477           | SYNE6 | JSB ERROR   | NO                               |
| 0176    | 02425           | 060432           |       | LDA M2      | YES,                             |
| 0177    | 02426           | 040135           |       | ADA SBPTR   | RETRIEVE                         |
| 0178    | 02427           | 160000           |       | LDA 0,I     | PARAMETER                        |
| 0179    | 02430           | 010401           |       | AND MSK1    | AND                              |
| 0180    | 02431           | 072334           |       | STA PFLAG   | SAVE IT                          |
| 0181    | 02432           | 017114           |       | JSB FSC     | FETCH DEFINING FORMULA           |
| 0182    | 02433           | 026346           |       | JMP EOST    | END-OF-STATEMENT TEST            |
| 0183*   |                 |                  |       |             |                                  |
| 0184*** |                 |                  |       | ***         |                                  |
| 0185**  | REM             | STATEMENT SYNTAX |       | **          |                                  |
| 0186*** |                 |                  |       | ***         |                                  |
| 0187*   |                 |                  |       |             |                                  |
| 0188    | 02434           | 060334           | REMS  | LDA .10     | DUMMY STRING TERMINATOR          |
| 0189    | 02435           | 114251           |       | JSB CHRSA,I | FETCH CHARACTER STRING           |
| 0190    | 02436           | 124252           |       | JMP ACCST,I |                                  |
| 0191*   |                 |                  |       |             |                                  |
| 0192*** |                 |                  |       | ***         |                                  |
| 0193**  | IF              | STATEMENT SYNTAX |       | **          |                                  |
| 0194*** |                 |                  |       | ***         |                                  |
| 0195*   |                 |                  |       |             |                                  |
| 0196    | 02437           | 017114           | IFS   | JSB FSC     | GET DECISION FORMULA             |
| 0197    | 02440           | 170135           |       | STA SBPTR,I | TABLE                            |
| 0198    | 02441           | 060316           |       | LDA ATHEN   | SEARCH                           |
| 0199    | 02442           | 007400           |       | CCB         | FOR                              |
| 0200    | 02443           | 114212           |       | JSB TSRCH,I | 'THEN'                           |
| 0201    | 02444           | 014477           |       | JSB ERROR   | NOT FOUND                        |
| 0202    | 02445           |                  | SYNE7 | EQU *       | GET STATEMENT LABEL NUMBER       |
| 0203*   |                 |                  |       |             |                                  |
| 0204*** |                 |                  |       | ***         |                                  |
| 0205**  | GO TO AND GOSUB | STATEMENT SYNTAX |       | **          |                                  |
| 0206*** |                 |                  |       | ***         |                                  |
| 0207    | 02445           | 114221           | GOTOS | JSB PGINT,I | FETCH AND RECORD                 |
| 0208    | 02446           | 000463           |       | DEF MAXSN   | SEQUENCE NUMBER                  |
| 0209    | 02447           | 026346           |       | JMP EOST    | END-OF-STATEMENT TEST            |
| 0210*   |                 |                  |       |             |                                  |
| 0211*   |                 |                  |       |             |                                  |
| 0212*** |                 |                  |       | ***         |                                  |
| 0213**  | FOR             | STATEMENT SYNTAX |       | **          |                                  |
| 0214*** |                 |                  |       | ***         |                                  |
| 0215*   |                 |                  |       |             |                                  |
| 0216    | 02450           | 017556           | FORS  | JSB VAROP   | FETCH SIMPLE VARIABLE            |
| 0217    | 02451           | 000000           |       | NOP         | NONE FOUND                       |
| 0218    | 02452           | 014477           | SYNE8 | JSB ERROR   | SUBSCRIPTED VARIABLE FOUND       |
| 0219    | 02453           | 007400           |       | CCB         |                                  |
| 0220    | 02454           | 015274           |       | JSB SYMCK   | ASSIGNMENT                       |
| 0221    | 02455           | 002272           |       | DEF ASSOP-1 | OPERATOR?                        |
| 0222    | 02456           | 026424           |       | JMP SYNE6   | NO                               |
| 0223    | 02457           | 017114           |       | JSB FSC     | YES, FETCH INITIAL VALUE FORMULA |
| 0224    | 02460           | 170135           |       | STA SBPTR,I | LOOK                             |
| 0225    | 02461           | 060317           |       | LDA ATO     | FOR                              |
| 0226    | 02462           | 007400           |       | CCB         | THE                              |
| 0227    | 02463           | 114212           |       | JSB TSRCH,I | 'TO'                             |
| 0228    | 02464           | 014477           |       | JSB ERROR   | MISSING                          |

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|         |       |           |          |         |           |                            |
|---------|-------|-----------|----------|---------|-----------|----------------------------|
| 0229    | 02465 | 017114    | SYNE9    | JSB     | FSC       | GET LIMIT FORMULA          |
| 0230    | 02466 | 050334    |          | CPA     | .10       | END-OF-STATEMENT?          |
| 0231    | 02467 | 124252    |          | JMP     | ACCST,I   | YES                        |
| 0232    | 02470 | 007400    |          | CCB     |           | NO, ERASE                  |
| 0233    | 02471 | 044135    |          | ADB     | SBPTR     | ZERO                       |
| 0234    | 02472 | 074135    |          | STB     | SBPTR     | WORD                       |
| 0235    | 02473 | 170135    |          | STA     | SBPTR,I   | NOW                        |
| 0236    | 02474 | 060320    |          | LDA     | ASTEP     | LOOK                       |
| 0237    | 02475 | 007400    |          | CCB     |           | FOR                        |
| 0238    | 02476 | 114212    |          | JSB     | T8RCH,I   | THE 'STEP'                 |
| 0239    | 02477 | 014477    |          | JSB     | ERROR     | MISSING                    |
| 0240    | 02500 | 017114    | SYE10    | JSB     | FSC       | GET STEP SIZE FORMULA      |
| 0241    | 02501 | 026346    |          | JMP     | EOST      | END-OF-STATEMENT TEST      |
| 0242*   |       |           |          |         |           |                            |
| 0243*** |       |           |          |         |           | ***                        |
| 0244**  | NEXT  | STATEMENT | SYNTAX   | **      |           |                            |
| 0245*** |       |           |          |         |           | ***                        |
| 0246*   |       |           |          |         |           |                            |
| 0247    | 02502 | 017556    | NXTS     | JSB     | VAROP     | FETCH SIMPLE VARIABLE      |
| 0248    | 02503 | 000000    |          | NOP     |           | NONE FOUND                 |
| 0249    | 02504 | 026452    |          | JMP     | SYNE8     | SUBSCRIPTED VARIABLE FOUND |
| 0250    | 02505 | 026346    |          | JMP     | EOST      | END-OF-STATEMENT TEST      |
| 0251*   |       |           |          |         |           |                            |
| 0252*** |       |           |          |         |           | ***                        |
| 0253**  | END,  | STOP,     | RESTORE, | RETURN  | STATEMENT | SYNTAX **                  |
| 0254*** |       |           |          |         |           | ***                        |
| 0255*   |       |           |          |         |           |                            |
| 0256    | 02506 | 034135    | ENDS     | ISZ     | SBPTR     |                            |
| 0257    | 02507 | 015614    |          | JSB     | GETCR     | END-OF-STATEMENT?          |
| 0258    | 02510 | 124252    |          | JMP     | ACCST,I   | YES                        |
| 0259    | 02511 | 024266    |          | JMP     | NOEOF     | NO                         |
| 0260*   |       |           |          |         |           |                            |
| 0261*** |       |           |          |         |           | ***                        |
| 0262**  | WAIT  | STATEMENT | SYNTAX   | **      |           |                            |
| 0263*** |       |           |          |         |           | ***                        |
| 0264*   |       |           |          |         |           |                            |
| 0265    | 02512 | 017734    | WAITs    | JSB     | GETPF     |                            |
| 0266    | 02513 | 026346    |          | JMP     | EOST      | END-OF-STATEMENT TEST      |
| 0267*   |       |           |          |         |           |                            |
| 0268*** |       |           |          |         |           | ***                        |
| 0269**  | CALL  | STATEMENT | SYNTAX   | **      |           |                            |
| 0270*** |       |           |          |         |           | ***                        |
| 0271*   |       |           |          |         |           |                            |
| 0272    | 02514 | 015614    | CALLS    | JSB     | GETCR     | FETCH AND                  |
| 0273    | 02515 | 024265    |          | JMP     | EOF       | RECORD                     |
| 0274    | 02516 | 034135    |          | ISZ     | SBPTR     | LEFT                       |
| 0275    | 02517 | 017661    |          | JSB     | LPCK      | PARENTHESIS                |
| 0276    | 02520 | 114221    |          | JSB     | PGINT,I   | FETCH AND RECORD           |
| 0277    | 02521 | 000453    |          | DEF     | D100      | SUBROUTINE NUMBER          |
| 0278    | 02522 | 070161    |          | STA     | TEMP1     | SAVE NEXT CHARACTER        |
| 0279    | 02523 | 015323    |          | JSB     | FND8B     | FIND                       |
| 0280    | 02524 | 160001    |          | LDA     | 1,I       | NUMBER                     |
| 0281    | 02525 | 001727    |          | ALF,ALF |           | OF                         |
| 0282    | 02526 | 010344    |          | AND     | .31       | PARAMETERS                 |
| 0283    | 02527 | 003000    |          | CMA     |           | RECORD                     |
| 0284    | 02530 | 070166    |          | STA     | TEMPS+7   | COMPLEMENT - 1             |

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|         |                                 |        |       |             |                              |
|---------|---------------------------------|--------|-------|-------------|------------------------------|
| 0285    | 02531                           | 060161 | LDA   | TEMP1       | RETRIEVE CHARACTER           |
| 0286    | 02532                           | 007400 | CALL2 | CCB         |                              |
| 0287    | 02533                           | 015274 | JSB   | SYMCK       | COMMA?                       |
| 0288    | 02534                           | 002260 | DEF   | COMMA-1     |                              |
| 0289    | 02535                           | 026543 | JMP   | CALL3       | NO                           |
| 0290    | 02536                           | 034166 | ISZ   | TEMPS+7     | YES, MORE                    |
| 0291    | 02537                           | 002001 | RSS   |             | PARAMETERS PERMITTED?        |
| 0292    | 02540                           | 014477 | SYE11 | JSB ERROR   | NO                           |
| 0293    | 02541                           | 017114 | JSB   | F8C         | YES, FETCH                   |
| 0294    | 02542                           | 026532 | JMP   | CALL2       | PARAMETER FORMULA            |
| 0295    | 02543                           | 034166 | CALL3 | ISZ TEMPS+7 | ALL PARAMETERS PRESENT?      |
| 0296    | 02544                           | 026540 | JMP   | SYE11       | NO                           |
| 0297    | 02545                           | 017671 | JSB   | RPCK        | YES, FETCH RIGHT PARENTHESIS |
| 0298    | 02546                           | 026346 | JMP   | EOST        | END-OF-STATEMENT TEST        |
| 0299*   |                                 |        |       |             |                              |
| 0300*** |                                 |        |       | ***         |                              |
| 0301**  | DATA STATEMENT SYNTAX           |        |       | **          |                              |
| 0302*** |                                 |        |       | ***         |                              |
| 0303*   |                                 |        |       |             |                              |
| 0304    | 02547                           | 014567 | DATAS | JSB CONST   | FETCH A CONSTANT             |
| 0305    | 02550                           | 024613 | JMP   | SYE12-1     | NONE FOUND                   |
| 0306    | 02551                           | 017744 | JSB   | NUMOP       | FIX UP PRECEDING OPERATOR    |
| 0307    | 02552                           | 007400 | CCB   |             | CHECK                        |
| 0308    | 02553                           | 015274 | JSB   | SYMCK       | FOR A                        |
| 0309    | 02554                           | 002260 | DEF   | COMMA-1     | COMMA                        |
| 0310    | 02555                           | 026346 | JMP   | EOST        | END-OF-STATEMENT TEST        |
| 0311    | 02556                           | 026547 | JMP   | DATAS       | FETCH ANOTHER NUMBER         |
| 0312*   |                                 |        |       |             |                              |
| 0313*** |                                 |        |       | ***         |                              |
| 0314**  | READ AND INPUT STATEMENT SYNTAX |        |       | **          |                              |
| 0315*** |                                 |        |       | ***         |                              |
| 0316*   |                                 |        |       |             |                              |
| 0317    | 02557                           | 017556 | READS | JSB VAROP   | RECORD VARIABLE OPERAND      |
| 0318    | 02560                           | 014477 | JSB   | ERROR       | MISSING                      |
| 0319    | 02561                           | 000000 | SYE13 | NOP         |                              |
| 0320    | 02562                           | 007400 | CCB   |             | CHECK                        |
| 0321    | 02563                           | 015274 | JSB   | SYMCK       | FOR A                        |
| 0322    | 02564                           | 002260 | DEF   | COMMA-1     | COMMA                        |
| 0323    | 02565                           | 002001 | RSS   |             |                              |
| 0324    | 02566                           | 026557 | JMP   | READS       | IS, FETCH NEXT ITEM          |
| 0325    | 02567                           | 006400 | CLB   |             | APPEND                       |
| 0326    | 02570                           | 174135 | STB   | SBPTR,1     | END-OF-FORMULA               |
| 0327    | 02571                           | 034135 | ISZ   | SBPTR       | OPERATOR                     |
| 0328    | 02572                           | 026346 | JMP   | EOST        | END OF STATEMENT TEST        |
| 0329*   |                                 |        |       |             |                              |
| 0330*** |                                 |        |       | ***         |                              |
| 0331**  | PRINT STATEMENT SYNTAX          |        |       | **          |                              |
| 0332*** |                                 |        |       | ***         |                              |
| 0333*   |                                 |        |       |             |                              |
| 0334    | 02573                           | 064432 | PRIN1 | LDB M2      | NO,                          |
| 0335    | 02574                           | 015274 | JSB   | SYMCK       | COMMA OR                     |
| 0336    | 02575                           | 002260 | DEF   | COMMA-1     | SEMICOLON?                   |
| 0337    | 02576                           | 026604 | JMP   | PRIN2       | NO                           |
| 0338    | 02577                           | 003400 | PRINS | CCA         | YES, ENABLE                  |
| 0339    | 02600                           | 170160 | STA   | TEMP,1      | FORMULA                      |
| 0340    | 02601                           | 034135 | ISZ   | SBPTR       |                              |

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|         |       |                  |       |             |                                  |
|---------|-------|------------------|-------|-------------|----------------------------------|
| 0341    | 02602 | 015614           |       | JSB GETCR   | END-OF-STATEMENT?                |
| 0342    | 02603 | 124252           |       | JMP ACCST,I | YES                              |
| 0343    | 02604 | 007400           | PRIN2 | CCB         |                                  |
| 0344    | 02605 | 015274           |       | JSB SYMCK   | QUOTE?                           |
| 0345    | 02606 | 002256           |       | DEF QUOTE-1 |                                  |
| 0346    | 02607 | 026623           |       | JMP PRIN3   | NO                               |
| 0347    | 02610 | 060347           |       | LDA .34     | YES, SET QUOTE AS TERMINATOR     |
| 0348    | 02611 | 114251           |       | JSB CHRSA,I | CHARACTER AND FETCH STRING       |
| 0349    | 02612 | 014477           |       | JSB ERROR   | MISSING QUOTE                    |
| 0350    | 02613 | 062257           | SYE14 | LDA QUOTE   | RECORD                           |
| 0351    | 02614 | 170135           |       | STA SBPTR,I | QUOTE                            |
| 0352    | 02615 | 034135           |       | ISZ SBPTR   |                                  |
| 0353    | 02616 | 015614           |       | JSB GETCR   | END-OF-STATEMENT?                |
| 0354    | 02617 | 124252           |       | JMP ACCST,I | YES                              |
| 0355    | 02620 | 007400           |       | CCB         | ENABLE                           |
| 0356    | 02621 | 174160           |       | STB TEMP,I  | FORMULA                          |
| 0357    | 02622 | 026573           |       | JMP PRIN1   | NO                               |
| 0358    | 02623 | 134160           | PRIN3 | ISZ TEMP,I  | TAB OR FORMULA PERMITTED?        |
| 0359    | 02624 | 014477           |       | JSB ERROR   | NO                               |
| 0360    | 02625 | 170135           | SYE15 | STA SBPTR,I | SEARCH                           |
| 0361    | 02626 | 060322           |       | LDA ATAB    | FOR                              |
| 0362    | 02627 | 007400           |       | CCB         | 'TAB'                            |
| 0363    | 02630 | 114212           |       | JSB TSRCH,I |                                  |
| 0364    | 02631 | 002401           |       | CLA,RSS     | NOT FOUND                        |
| 0365    | 02632 | 060424           |       | LDA TABCN   |                                  |
| 0366    | 02633 | 007400           |       | CCB         | BACKUP                           |
| 0367    | 02634 | 044135           |       | ADB SBPTR   | TO WORD WITH                     |
| 0368    | 02635 | 074135           |       | STB SBPTR   | PREVIOUS OPERATOR                |
| 0369    | 02636 | 002003           |       | SZA,RSS     | 'TAB' ?                          |
| 0370    | 02637 | 026647           |       | JMP PRIN4   | NO                               |
| 0371    | 02640 | 130135           |       | IOR SBPTR,I |                                  |
| 0372    | 02641 | 170135           |       | STA SBPTR,I | YES, RECORD IT                   |
| 0373    | 02642 | 017734           |       | JSB GETPF   | FETCH PARAMETER                  |
| 0374    | 02643 | 006400           |       | CLB         | FOLLOW                           |
| 0375    | 02644 | 174135           |       | STB SBPTR,I | WITH A                           |
| 0376    | 02645 | 034135           |       | ISZ SBPTR   | ZERO                             |
| 0377    | 02646 | 026651           |       | JMP PRIN5   |                                  |
| 0378    | 02647 | 015633           | PRIN4 | JSB BCKSP   | BACKSPACE OVER LAST CHARACTER    |
| 0379    | 02650 | 017114           |       | JSB F8C     | FETCH FORMULA                    |
| 0380    | 02651 | 050334           | PRIN5 | CPA .10     | END-OF-STATEMENT?                |
| 0381    | 02652 | 124252           |       | JMP ACCST,I | YES                              |
| 0382    | 02653 | 026573           |       | JMP PRIN1   | NO                               |
| 0383*   |       |                  |       |             |                                  |
| 0384*** |       |                  |       | ***         |                                  |
| 0385**  | MAT   | STATEMENT SYNTAX |       | **          |                                  |
| 0386*** |       |                  |       | ***         |                                  |
| 0387*   |       |                  |       |             |                                  |
| 0388    | 02654 | 017635           | MATS  | JSB LTR     | FIRST                            |
| 0389    | 02655 | 014477           |       | JSB ERROR   | TWO CHARACTERS                   |
| 0390    | 02656 | 015603           | SYE16 | JSB LETCK   | LETTERS?                         |
| 0391    | 02657 | 026722           |       | JMP MATS2   | NO                               |
| 0392    | 02660 | 034135           |       | ISZ SBPTR   | YES, MOVE TO FRESH S-BUFFER WORD |
| 0393    | 02661 | 064161           |       | LDB TEMP1   | RETRIEVE FIRST LETTER AND        |
| 0394    | 02662 | 005727           |       | BLF,BLF     | PUT IT IN THE                    |
| 0395    | 02663 | 030001           |       | IOR 1       | UPPER CHARACTER OF (A)           |
| 0396    | 02664 | 170135           |       | STA SBPTR,I | SEARCH                           |

|      |       |        |                 |                           |
|------|-------|--------|-----------------|---------------------------|
| 0397 | 02665 | 060310 | LDA MAT10       | FOR                       |
| 0398 | 02666 | 064432 | LDB M2          | 'READ' OR                 |
| 0399 | 02667 | 114212 | JSB TSEARCH,1   | 'PRINT'                   |
| 0400 | 02670 | 014477 | JSB ERROR       | NOT FOUND                 |
| 0401 | 02671 | 050416 | SYE17 CPA RDOP  | READ?                     |
| 0402 | 02672 | 026710 | JMP MATS1       | YES                       |
| 0403 | 02673 | 017544 | MATS0 JSB ARRID | RECORD ARRAY              |
| 0404 | 02674 | 050334 | CPA .10         | END-OF-STATEMENT?         |
| 0405 | 02675 | 124252 | JMP ACCST,1     | YES                       |
| 0406 | 02676 | 064432 | LDB M2          | NO,                       |
| 0407 | 02677 | 015274 | JSB SYMCK       | COMMA OR                  |
| 0408 | 02700 | 002260 | DEF COMMA-1     | SEMICOLON?                |
| 0409 | 02701 | 014477 | JSB ERROR       | NO                        |
| 0410 | 02702 | 015614 | SYE18 JSB GETCR | END-OF-STATEMENT?         |
| 0411 | 02703 | 026706 | JMP *+3         | YES                       |
| 0412 | 02704 | 015633 | JSB BCKSP       | NO                        |
| 0413 | 02705 | 026673 | JMP MATS0       | INCLUDE                   |
| 0414 | 02706 | 034135 | ISZ SBPTR       | PARAMETER                 |
| 0415 | 02707 | 124252 | JMP ACCST,1     | RECORD ARRAY              |
| 0416 | 02710 | 017544 | MATS1 JSB ARRID | IF SUBSCRIPT,             |
| 0417 | 02711 | 017704 | JSB MATS0       | RECORD IT                 |
| 0418 | 02712 | 000000 | NOP             | END-OF-STATEMENT?         |
| 0419 | 02713 | 050334 | CPA .10         | YES                       |
| 0420 | 02714 | 124252 | JMP ACCST,1     | NO                        |
| 0421 | 02715 | 007400 | CCB             | COMMA?                    |
| 0422 | 02716 | 015274 | JSB SYMCK       | NO                        |
| 0423 | 02717 | 002260 | DEF COMMA-1     | YES                       |
| 0424 | 02720 | 026701 | JMP SYE18-1     | SAVE                      |
| 0425 | 02721 | 026710 | JMP MATS1       | OPERAND ADDRESS           |
| 0426 | 02722 | 070162 | MATS2 STA TEMP2 | RETRIEVE FIRST LETTER     |
| 0427 | 02723 | 060135 | LDA SBPTR       | RECORD AN                 |
| 0428 | 02724 | 071715 | STA ARYAD       | ARRAY                     |
| 0429 | 02725 | 060161 | LDA TEMP1       | RETRIEVE CHARACTER        |
| 0430 | 02726 | 064355 | LDB .46         | ASSIGNMENT                |
| 0431 | 02727 | 017650 | JSB STROP       | OPERATOR?                 |
| 0432 | 02730 | 060162 | LDA TEMP2       | NO                        |
| 0433 | 02731 | 007400 | CCB             | YES, RETRIEVE             |
| 0434 | 02732 | 015274 | JSB SYMCK       | AND SAVE                  |
| 0435 | 02733 | 002272 | DEF ASSOP-1     | PREVIOUS ARRAY IDENTIFIER |
| 0436 | 02734 | 026424 | JMP SYNE6       | LETTER NEXT?              |
| 0437 | 02735 | 161715 | LDA ARYAD,1     | NO                        |
| 0438 | 02736 | 010401 | AND MSK1        | YES, SECOND LETTER?       |
| 0439 | 02737 | 170160 | STA TEMP,1      | NO                        |
| 0440 | 02740 | 017635 | JSB LTR         | YES,                      |
| 0441 | 02741 | 027010 | JMP MATS4       | CONCATENATE               |
| 0442 | 02742 | 015603 | JSB LETCK       | LETTERS                   |
| 0443 | 02743 | 027024 | JMP MATS5       | AND                       |
| 0444 | 02744 | 034135 | ISZ SBPTR       | SEARCH                    |
| 0445 | 02745 | 064161 | LDB TEMP1       | FOR                       |
| 0446 | 02746 | 005727 | BLF, BLF        | ARRAY                     |
| 0447 | 02747 | 030001 | IOR 1           | FUNCTION                  |
| 0448 | 02750 | 170135 | STA SBPTR,1     |                           |
| 0449 | 02751 | 060313 | LDA MATFN       |                           |
| 0450 | 02752 | 064435 | LDB M5          |                           |
| 0451 | 02753 | 114212 | JSB TSEARCH,1   |                           |
| 0452 | 02754 | 014477 | JSB ERROR       | NOT FOUND                 |

|      |       |        |       |             |                             |
|------|-------|--------|-------|-------------|-----------------------------|
| 0453 | 02755 | 001727 | SYE19 | ALF,ALF     | FOUND                       |
| 0454 | 02756 | 001723 |       | ALF,RAR     | POSITION IT,                |
| 0455 | 02757 | 040336 |       | ADA .15     | COMPLETE OPERAND,           |
| 0456 | 02760 | 007400 |       | CCB         | COMBINE                     |
| 0457 | 02761 | 044135 |       | ADB SBPTR   | WITH                        |
| 0458 | 02762 | 130001 |       | IOR 1,I     | OPERATOR,                   |
| 0459 | 02763 | 030470 |       | IOR FLGBT   | ADD FLAG BIT,               |
| 0460 | 02764 | 170001 |       | STA 1,I     | AND STORE                   |
| 0461 | 02765 | 010401 |       | AND MSK1    | 'INV'                       |
| 0462 | 02766 | 040460 |       | ADA M256    | OR                          |
| 0463 | 02767 | 002021 |       | SSA,RSS     | 'TRN?                       |
| 0464 | 02770 | 026776 |       | JMP MATS3   | YES                         |
| 0465 | 02771 | 015614 |       | JSB GETCR   | NO, END-OF-STATEMENT?       |
| 0466 | 02772 | 124252 |       | JMP ACCST,I | YES                         |
| 0467 | 02773 | 017704 |       | JSB MATSB   | NO, SUBSCRIPT?              |
| 0468 | 02774 | 014477 |       | JSB ERROR   | NO                          |
| 0469 | 02775 | 024266 | SYE20 | JMP NOEOF   |                             |
| 0470 | 02776 | 015614 | MATS3 | JSB GETCR   |                             |
| 0471 | 02777 | 024265 |       | JMP EOF     |                             |
| 0472 | 03000 | 017661 |       | JSB LPCK    | GET LEFT PARENTHESIS        |
| 0473 | 03001 | 017544 |       | JSB ARRID   | FETCH AND RECORD AN ARRAY   |
| 0474 | 03002 | 017671 |       | JSB RPCK    | RECORD A RIGHT PARENTHESIS  |
| 0475 | 03003 | 161715 |       | LDA ARYAD,I | RETRIEVE                    |
| 0476 | 03004 | 010401 |       | AND MSK1    | PREVIOUS ARRAY IDENTIFIER   |
| 0477 | 03005 | 150160 |       | CPA TEMP,I  | MATCH LEFT-HAND SIDE ARRAY? |
| 0478 | 03006 | 014477 |       | JSB ERROR   | YES                         |
| 0479 | 03007 | 124252 | SYE21 | JMP ACCST,I | NO                          |
| 0480 | 03010 | 034135 | MATS4 | ISZ SBPTH   |                             |
| 0481 | 03011 | 017661 |       | JSB LPCK    | FETCH LEFT PARENTHESIS      |
| 0482 | 03012 | 017114 |       | JSB FSC     | FETCH FORMULA               |
| 0483 | 03013 | 017671 |       | JSB RPCK    | FETCH RIGHT PARENTHESIS     |
| 0484 | 03014 | 007400 |       | CCB         | MULTIPLICATION              |
| 0485 | 03015 | 015274 |       | JSB SYMCK   | OPERATOR?                   |
| 0486 | 03016 | 002300 |       | DEF TIMES-1 |                             |
| 0487 | 03017 | 014477 |       | JSB ERROR   | NO                          |
| 0488 | 03020 | 017544 | SYE22 | JSB ARRID   | YES, FETCH AND RECORD ARRAY |
| 0489 | 03021 | 050334 |       | CPA .10     | END-OF-STATEMENT?           |
| 0490 | 03022 | 124252 |       | JMP ACCST,I | YES                         |
| 0491 | 03023 | 024266 |       | JMP NOEOF   | NO                          |
| 0492 | 03024 | 070162 | MATS5 | STA TEMP2   |                             |
| 0493 | 03025 | 060135 |       | LDA SBPTR   | SAVE                        |
| 0494 | 03026 | 071715 |       | STA ARYAD   | OPERAND ADDRESS             |
| 0495 | 03027 | 060161 |       | LDA TEMP1   | RETRIEVE                    |
| 0496 | 03030 | 064355 |       | LDB .46     | AND RECORD                  |
| 0497 | 03031 | 017660 |       | JSB STROP   | ARRAY                       |
| 0498 | 03032 | 060162 |       | LDA TEMP2   | END-OF-                     |
| 0499 | 03033 | 050334 |       | CPA .10     | STATEMENT?                  |
| 0500 | 03034 | 124252 |       | JMP ACCST,I | YES                         |
| 0501 | 03035 | 064433 |       | LDB M3      | NO, MUST BE                 |
| 0502 | 03036 | 015274 |       | JSB SYMCK   | A '+',                      |
| 0503 | 03037 | 002274 |       | DEF PLUS-1  | '-', OR '*'                 |
| 0504 | 03040 | 014477 |       | JSB ERROR   | ISN'T                       |
| 0505 | 03041 | 006400 | SYE23 | CLB         | IS, SET FOR FALSE           |
| 0506 | 03042 | 040332 |       | ADA .8      |                             |
| 0507 | 03043 | 052301 |       | CPA TIMES   | '*'?                        |
| 0508 | 03044 | 027061 |       | JMP MATS7   | YES                         |

|      |       |        |       |             |                             |
|------|-------|--------|-------|-------------|-----------------------------|
| 0509 | 03045 | 076334 | MATS6 | STB PFLAG   | NO, SET PFLAG               |
| 0510 | 03046 | 017544 |       | JSB ARRID   | GET SECOND ARRAY            |
| 0511 | 03047 | 050334 |       | CPA .10     | END-OF-STATEMENT?           |
| 0512 | 03050 | 002001 |       | RSS         | YES                         |
| 0513 | 03051 | 024266 |       | JMP NOEOF   | NO                          |
| 0514 | 03052 | 036334 |       | ISZ PFLAG   | WAS OPERATOR A '*'?         |
| 0515 | 03053 | 124252 |       | JMP ACCST,I | NO                          |
| 0516 | 03054 | 161715 |       | LDA ARYAD,I | YES, RETRIEVE               |
| 0517 | 03055 | 010401 |       | AND MSK1    | SECOND ARRAY                |
| 0518 | 03056 | 150160 |       | CPA TEMP,I  | MATCH LEFT-HAND SIDE ARRAY? |
| 0519 | 03057 | 014477 | SYE24 | JSB ERROR   | YES                         |
| 0520 | 03060 | 124252 |       | JMP ACCST,I | NO                          |
| 0521 | 03061 | 161715 | MATS7 | LDA ARYAD,I | RETRIEVE                    |
| 0522 | 03062 | 010401 |       | AND MSK1    | ARRAY                       |
| 0523 | 03063 | 007400 |       | CCB         | SET FOR TRUE                |
| 0524 | 03064 | 150160 |       | CPA TEMP,I  | MATCH LEFT-HAND SIDE ARRAY? |
| 0525 | 03065 | 027057 |       | JMP SYE24   | YES                         |
| 0526 | 03066 | 027045 |       | JMP MATS6   | NO                          |

0527\*\*

0528\*\*\* JUMP TABLE FOR STATEMENT SYNTAX \*\*

0529\*\*

|      |       |        |       |           |         |
|------|-------|--------|-------|-----------|---------|
| 0530 | 03067 | 002340 | SYNTB | DEF LETS  | LET     |
| 0531 | 03070 | 002351 |       | DEF DIMS  | DIM     |
| 0532 | 03071 | 002355 |       | DEF COMS  | COM     |
| 0533 | 03072 | 002374 |       | DEF DEFS  | DEF     |
| 0534 | 03073 | 002434 |       | DEF REMS  | REM     |
| 0535 | 03074 | 002445 |       | DEF GOTOS | GO TO   |
| 0536 | 03075 | 002437 |       | DEF IFS   | IF      |
| 0537 | 03076 | 002450 |       | DEF FORS  | FOR     |
| 0538 | 03077 | 002502 |       | DEF NXTS  | NEXT    |
| 0539 | 03100 | 002445 |       | DEF GOTOS | GOSUB   |
| 0540 | 03101 | 002506 |       | DEF ENDS  | RETURN  |
| 0541 | 03102 | 002506 |       | DEF ENDS  | END     |
| 0542 | 03103 | 002506 |       | DEF ENDS  | STOP    |
| 0543 | 03104 | 002512 |       | DEF WAITs | WAIT    |
| 0544 | 03105 | 002514 |       | DEF CALLS | CALL    |
| 0545 | 03106 | 002547 |       | DEF DATAS | DATA    |
| 0546 | 03107 | 002557 |       | DEF READS | READ    |
| 0547 | 03110 | 002577 |       | DEF PRINS | PRINT   |
| 0548 | 03111 | 002557 |       | DEF READS | INPUT   |
| 0549 | 03112 | 002506 |       | DEF ENDS  | RESTORE |
| 0550 | 03113 | 002654 |       | DEF MATS  | MAT     |

0551\*

0552\*\*\*

0553\*\* FORMULA SYNTAX CHECKER \*\*

0554\*\*\*

0555\*

|      |       |        |      |             |                            |
|------|-------|--------|------|-------------|----------------------------|
| 0556 | 03114 | 000000 | FSC  | NOP         |                            |
| 0557 | 03115 | 002400 |      | CLA         | SET LEFT PARENTHESIS       |
| 0558 | 03116 | 170157 |      | STA TEMPS,I | COUNT TO ZERO              |
| 0559 | 03117 | 003400 | FSC1 | CCA         | SET UNARY FLAG             |
| 0560 | 03120 | 072336 |      | STA UFLAG   | TO TRUE                    |
| 0561 | 03121 | 017556 | FSC2 | JSB VAROP   | LOOK FOR VARIABLE OPERAND  |
| 0562 | 03122 | 027261 |      | JMP FSC9    | NOT FOUND                  |
| 0563 | 03123 | 027227 |      | JMP FSC6    | SUBSCRIPTED VARIABLE FOUND |
| 0564 | 03124 | 015603 |      | JSB LETCK   | FOLLOWED BY LETTER?        |

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|      |       |        |                 |                                  |
|------|-------|--------|-----------------|----------------------------------|
| 0565 | 03125 | 027227 | JMP FSC6        | NO                               |
| 0566 | 03126 | 064432 | LDB M2          | YES, LOOK FOR                    |
| 0567 | 03127 | 017322 | JSB MCBCK       | 'AND' OR 'OR'                    |
| 0568 | 03130 | 060161 | LDA TEMP1       | NOT FOUND, FETCH PREVIOUS        |
| 0569 | 03131 | 001727 | ALF,ALF         | CHARACTER AND LEFT-JUSTIFY IT    |
| 0570 | 03132 | 030162 | IOR TEMP2       | ADD LATEST CHARACTER             |
| 0571 | 03133 | 050464 | CPA FN          | 'FN'?                            |
| 0572 | 03134 | 027162 | JMP FSC4        | YES                              |
| 0573 | 03135 | 170135 | STA SBPTR,I     | NO,                              |
| 0574 | 03136 | 060312 | LDA PDFNS       | SEARCH FOR                       |
| 0575 | 03137 | 064443 | LDB M11         | PREDEFINED                       |
| 0576 | 03140 | 114212 | JSB TSRCH,I     | FUNCTION                         |
| 0577 | 03141 | 027146 | JMP FSC3        | NOT FOUND                        |
| 0578 | 03142 | 001727 | ALF,ALF         | ASSEMBLE                         |
| 0579 | 03143 | 001723 | ALF,RAR         | OPERAND                          |
| 0580 | 03144 | 030470 | IOR FLGBT       | ADD FLAG BIT                     |
| 0581 | 03145 | 027170 | JMP FSC5        |                                  |
| 0582 | 03146 | 036336 | FSC3 ISZ UFLAG  | 'NOT' PERMITTED?                 |
| 0583 | 03147 | 027252 | JMP FSC8-1      | NO                               |
| 0584 | 03150 | 060321 | LDA ANOT        | YES,                             |
| 0585 | 03151 | 007400 | CCB             | SEARCH FOR                       |
| 0586 | 03152 | 114212 | JSB TSRCH,I     | 'NOT'                            |
| 0587 | 03153 | 027252 | JMP FSC8-1      | 'NOT' NOT FOUND                  |
| 0588 | 03154 | 007400 | CCB             | RETRIEVE                         |
| 0589 | 03155 | 044135 | ADB SBPTR       | PREVIOUS WORD                    |
| 0590 | 03156 | 160001 | LDA 1,I         | WORD                             |
| 0591 | 03157 | 010420 | AND OPMSK       | SET TO                           |
| 0592 | 03160 | 170001 | STA 1,I         | NULL OPERAND                     |
| 0593 | 03161 | 027317 | JMP FSC14       |                                  |
| 0594 | 03162 | 015614 | FSC4 JSB GETCR  | IDENTIFYING                      |
| 0595 | 03163 | 026405 | JMP SYNE4       | FUNCTION                         |
| 0596 | 03164 | 015603 | JSB LETCK       | LETTER?                          |
| 0597 | 03165 | 026405 | JMP SYNE4       | NO                               |
| 0598 | 03166 | 040453 | ADA D100        | YES,                             |
| 0599 | 03167 | 001700 | ALF             | ASSEMBLE AND                     |
| 0600 | 03170 | 040336 | FSC5 ADA .15    | SAVE                             |
| 0601 | 03171 | 070161 | STA TEMP1       | FUNCTION IDENTIFIER              |
| 0602 | 03172 | 007400 | CCB             | RETRIEVE                         |
| 0603 | 03173 | 044135 | ADB SBPTR       | PREVIOUS                         |
| 0604 | 03174 | 160001 | LDA 1,I         | PROGRAM WORD                     |
| 0605 | 03175 | 010420 | AND OPMSK       | EXTRACT OPERATOR,                |
| 0606 | 03176 | 030161 | IOR TEMP1       | APPEND OPERAND,                  |
| 0607 | 03177 | 170001 | STA 1,I         | AND RECORD                       |
| 0608 | 03200 | 015614 | JSB GETCR       | LEFT PARENTHESIS                 |
| 0609 | 03201 | 014477 | FSCE1 JSB ERROR | OR                               |
| 0610 | 03202 | 017661 | JSB LPCK        | LEFT BRACKET?                    |
| 0611 | 03203 | 017353 | JSB FRCUR       | YES, SAVE LOCAL VARIABLES OF FSC |
| 0612 | 03204 | 017114 | JSB FSC         | FETCH ACTUAL PARAMETER           |
| 0613 | 03205 | 017330 | JSB FPOP        | RESTORE LOCAL VARIABLES OF FSC   |
| 0614 | 03206 | 017671 | JSB RPCK        | FETCH RIGHT PARENTHESIS          |
| 0615 | 03207 | 027272 | JMP FSC10+1     |                                  |
| 0616 | 03210 | 064432 | FSC7 LDB M2     | CHECK FOR                        |
| 0617 | 03211 | 015274 | JSB SYMCK       | RIGHT PARENTHESIS                |
| 0618 | 03212 | 002264 | DEF RPARN-1     | OR RIGHT BRACKET                 |
| 0619 | 03213 | 027253 | JMP FSC8        | NOT FOUND                        |
| 0620 | 03214 | 060406 | LDA B4000       | RECORD A                         |



|       |       |        |       |             |                                |
|-------|-------|--------|-------|-------------|--------------------------------|
| 0621  | 03215 | 170135 |       | STA SBPTR,I | RIGHT PARENTHESIS              |
| 0622  | 03216 | 060352 |       | LDA .41     | RESTORE RIGHT PARENTHESIS      |
| 0623  | 03217 | 007400 |       | CCB         | MATCHING                       |
| 0624  | 03220 | 144157 |       | ADB TEMPS,I | LEFT                           |
| 0625  | 03221 | 006020 |       | SSB         | PARENTHESIS?                   |
| 0626  | 03222 | 027253 |       | JMP FSC8    | NO                             |
| 0627  | 03223 | 174157 |       | STB TEMPS,I | YES                            |
| 0628  | 03224 | 034135 |       | ISZ SBPTR   |                                |
| 0629  | 03225 | 015614 |       | JSB GETCR   | FETCH                          |
| 0630  | 03226 | 060334 |       | LDA .10     | CHARACTER                      |
| 0631  | 03227 | 050334 | FSC6  | CPA .10     | END OF FORMULA?                |
| 0632  | 03230 | 027253 |       | JMP FSC8    | YES                            |
| 0633  | 03231 | 072336 |       | STA UFLAG   | NO, SET UNARY FLAG TO FALSE    |
| 0634  | 03232 | 064435 |       | LDB M5      | SEARCH FOR A MULTICHARACTER    |
| 0635  | 03233 | 017322 |       | JSB MCBCK   | BINARY OPERATOR                |
| 0636  | 03234 | 160135 |       | LDA SBPTR,I | NOT FOUND,                     |
| 0637  | 03235 | 001727 |       | ALF,ALF     | RESTORE                        |
| 0638  | 03236 | 010374 |       | AND B177    | CHARACTER                      |
| 0639  | 03237 | 066330 |       | LDB MSFLG   | SEARCH                         |
| 0640  | 03240 | 015274 |       | JSB SYMCK   | FOR A                          |
| 0641  | 03241 | 002274 |       | DEF PLUS-1  | BINARY OPERATOR                |
| 0642  | 03242 | 002001 |       | RSS         | NOT FOUND                      |
| 0643  | 03243 | 027301 |       | JMP FSC12   | FOUND                          |
| 0644  | 03244 | 007400 |       | CCB         | ASSIGNMENT                     |
| 0645  | 03245 | 015274 |       | JSB SYMCK   |                                |
| 0646  | 03246 | 002272 |       | DEF ASSOP-1 | OPERATOR?                      |
| 0647  | 03247 | 027210 |       | JMP FSC7    | NO                             |
| 0648  | 03250 | 073530 |       | STA SFLAG   | YES, SET                       |
| 0649  | 03251 | 027117 |       | JMP FSC1    | 'STORE OCCURRED' FLAG          |
| 0650  | 03252 | 060162 |       | LDA TEMP2   | RETRIEVE LETTER                |
| 0651  | 03253 | 164157 | FSC8  | LDB TEMPS,I | ALL LEFT PARENTHESES           |
| 0652  | 03254 | 006002 |       | SZB         | MATCHED?                       |
| 0653  | 03255 | 014477 | FSC12 | JSB ERROR   | NO                             |
| 0654  | 03256 | 174135 |       | STB SBPTR,I | YES, RECORD AN                 |
| 0655  | 03257 | 034135 |       | ISZ SBPTR   | END-OF-FORMULA AND             |
| 0656  | 03260 | 127114 |       | JMP FSC,I   | EXIT WITH CHARACTER IN (A)     |
| 0657* |       |        |       |             |                                |
| 0658  | 03261 | 050351 | FSC9  | CPA .40     | LEFT                           |
| 0659  | 03262 | 027275 |       | JMP FSC11   | PARENTHESIS                    |
| 0660  | 03263 | 050373 |       | CPA B133    | OR LEFT BRACKET?               |
| 0661  | 03264 | 027275 |       | JMP FSC11   | YES                            |
| 0662  | 03265 | 006400 |       | CLB         | NO, SET SIGN                   |
| 0663  | 03266 | 074153 |       | STB SIGN    | POSITIVE                       |
| 0664  | 03267 | 014615 |       | JSB NUMCK   | NUMBER?                        |
| 0665  | 03270 | 027304 |       | JMP FSC13   | NO                             |
| 0666  | 03271 | 017744 | FSC10 | JSB NUMOP   | YES, FIX UP PRECEDING OPERATOR |
| 0667  | 03272 | 064441 |       | LDB M9      | UPDATE                         |
| 0668  | 03273 | 076330 |       | STB MSFLG   | MULTIPLE STORE                 |
| 0669  | 03274 | 027227 |       | JMP FSC6    | FLAG                           |
| 0670  | 03275 | 034135 | FSC11 | ISZ SBPTR   | YES                            |
| 0671  | 03276 | 060413 |       | LDA B2300   | RECORD                         |
| 0672  | 03277 | 170135 |       | STA SBPTR,I | IT AND                         |
| 0673  | 03300 | 134157 |       | ISZ TEMPS,I | COUNT IT                       |
| 0674  | 03301 | 064441 | FSC12 | LDB M9      | UPDATE                         |
| 0675  | 03302 | 076330 |       | STB MSFLG   | MULTIPLE STORE FLAG            |
| 0676  | 03303 | 027117 |       | JMP FSC1    | FLAG                           |

|   |       |        |       |     |         |                               |
|---|-------|--------|-------|-----|---------|-------------------------------|
| 0677  | 03304 | 036336 | FSC13 | ISZ | UFLAG   | UNARY OPERATORS PERMITTED?    |
| 0678  | 03305 | 014477 | FSCE3 | JSH | ERROR   | NO                            |
| 0679  | 03306 | 064411 |       | LDB | UNMNC   |                               |
| 0680  | 03307 | 050353 |       | CPA | .43     | '+'?                          |
| 0681  | 03310 | 027314 |       | JMP | ++4     | YES                           |
| 0682  | 03311 | 050354 |       | CPA | .45     | NO, '-'?                      |
| 0683  | 03312 | 027315 |       | JMP | ++3     | YES                           |
| 0684  | 03313 | 027305 |       | JMP | FSCE3   | NO                            |
| 0685  | 03314 | 044404 |       | ADB | B3000   | STORE                         |
| 0686  | 03315 | 034135 |       | ISZ | SBPTR   | UNARY                         |
| 0687  | 03316 | 174135 |       | STB | SBPTR,I | OPERATOR                      |
| 0688  | 03317 | 064441 | FSC14 | LDB | M9      | UPDATE                        |
| 0689  | 03320 | 076330 |       | STB | MSFLG   | MULTIPLE STORE FLAG           |
| 0690  | 03321 | 027121 |       | JMP | FSC2    | FLAG                          |
| 0691**  |       |        |       |     |         |                               |
| 0692*** CHECK FOR A MULTICHARACTER BINARY OPERATOR ** |       |        |       |     |         |                               |
| 0693**  |       |        |       |     |         |                               |
| 0694  | 03322 | 000000 | MCBCK | NOP |         |                               |
| 0695  | 03323 | 170135 |       | STA | SBPTR,I | SEARCH                        |
| 0696  | 03324 | 060311 |       | LDA | MCBOP   | FOR 'AND'                     |
| 0697  | 03325 | 114212 |       | JSH | T8RCH,I | OR 'OR'                       |
| 0698  | 03326 | 127322 |       | JMP | MCBCK,I | NOT FOUND                     |
| 0699  | 03327 | 027301 |       | JMP | FSC12   | FOUND                         |
| 0001**  |       |        |       |     |         |                               |
| 0002*** RESTORE FSC LOCAL QUANTITIES **               |       |        |       |     |         |                               |
| 0003**  |       |        |       |     |         |                               |
| 0004  | 03330 | 000000 | FPOP  | NOP |         |                               |
| 0005  | 03331 | 070161 |       | STA | TEMP1   | SAVE CHARACTER                |
| 0006  | 03332 | 064157 |       | LDB | TEMPS   |                               |
| 0007  | 03333 | 044435 |       | ADB | M5      |                               |
| 0008  | 03334 | 074157 |       | STB | TEMPS   | RESTORE S-STACK TOP           |
| 0009  | 03335 | 006004 |       | INB |         |                               |
| 0010  | 03336 | 160001 |       | LDA | 1,I     |                               |
| 0011  | 03337 | 072330 |       | STA | MSFLG   | RESTORE MULTIPLE STORE FLAG   |
| 0012  | 03340 | 006004 |       | INB |         |                               |
| 0013  | 03341 | 160001 |       | LDA | 1,I     |                               |
| 0014  | 03342 | 072336 |       | STA | UFLAG   | RESTORE UNARY OPERATOR FLAG   |
| 0015  | 03343 | 006004 |       | INB |         |                               |
| 0016  | 03344 | 160001 |       | LDA | 1,I     |                               |
| 0017  | 03345 | 073114 |       | STA | FSC     | RESTORE FSC RETURN ADDRESS    |
| 0018  | 03346 | 006004 |       | INB |         |                               |
| 0019  | 03347 | 160001 |       | LDA | 1,I     | RESTORE                       |
| 0020  | 03350 | 073556 |       | STA | VAROP   | VAROP RETURN ADDRESS          |
| 0021  | 03351 | 060161 |       | LDA | TEMP1   | RETRIEVE CHARACTER            |
| 0022  | 03352 | 127330 |       | JMP | FPOP,I  |                               |
| 0023**  |       |        |       |     |         |                               |
| 0024*** SAVE LOCAL QUANTITIES OF FSC **               |       |        |       |     |         |                               |
| 0025**  |       |        |       |     |         |                               |
| 0026  | 03353 | 000000 | FRCUR | NOP |         |                               |
| 0027  | 03354 | 064157 |       | LDB | TEMPS   | FETCH CURRENT S-STACK POINTER |
| 0028  | 03355 | 006004 |       | INB |         | UPDATE IT                     |
| 0029  | 03356 | 062330 |       | LDA | MSFLG   | DUMP MULTIPLE STORE           |
| 0030  | 03357 | 170001 |       | STA | 1,I     | FLAG ON S-STACK               |
| 0031  | 03360 | 006004 |       | INB |         |                               |
| 0032  | 03361 | 062336 |       | LDA | UFLAG   | STACK UNARY OPERATOR          |
| 0033  | 03362 | 170001 |       | STA | 1,I     | FLAG                          |

|   |       |        |                 |                                |
|---|-------|--------|-----------------|--------------------------------|
| 0034  | 03363 | 006004 | INB             |                                |
| 0035  | 03364 | 063114 | LDA FSC         | STACK FSC                      |
| 0036  | 03365 | 170001 | STA 1,I         | RETURN ADDRESS                 |
| 0037  | 03366 | 063556 | LDA VAROP       | STACK VAROP RETURN ADDRESS     |
| 0038  | 03367 | 017371 | JSB SSOV        | AND CHECK FOR S-STACK OVERFLOW |
| 0039  | 03370 | 127353 | JMP FRCUR,I     |                                |
| 0040**  |       |        |                 |                                |
| 0041*** PUT ITEM ON S-STACK AND CHECK FOR OVERFLOW ** |       |        |                 |                                |
| 0042**  |       |        |                 |                                |
| 0043  | 03371 | 000000 | SSOV NOP        | STORE QUANTITY                 |
| 0044  | 03372 | 006004 | INB             | ADVANCE S-STACK POINTER        |
| 0045  | 03373 | 170001 | STA 1,I         | SAVE ITEM IN (A)               |
| 0046  | 03374 | 006004 | INB             | ADVANCE S-STACK POINTER        |
| 0047  | 03375 | 074157 | STB TEMPS       | AND RECORD IT                  |
| 0048  | 03376 | 007004 | CMB,INB         |                                |
| 0049  | 03377 | 044106 | ADB LWBH        | LAST WORD                      |
| 0050  | 03400 | 006020 | SSB             | EXCEEDED?                      |
| 0051  | 03401 | 014477 | FSCE4 JSB ERROR | YES                            |
| 0052  | 03402 | 127371 | JMP SSOV,I      |                                |
| 0053**  |       |        |                 |                                |
| 0054*** CHECK FOR SUBSCRIPT PART **                   |       |        |                 |                                |
| 0055**  |       |        |                 |                                |
| 0056  | 03403 | 000000 | SBSCK NOP       | CHARACTER IN (A)               |
| 0057  | 03404 | 064432 | LDB M2          | LEFT BRACKET                   |
| 0058  | 03405 | 015274 | JSB SYMCK       | OR                             |
| 0059  | 03406 | 002320 | DEF LBRAC-1     | LEFT PARENTHESIS?              |
| 0060  | 03407 | 127403 | JMP SBSCK,I     | NO, RETURN VIA (P+1)           |
| 0061  | 03410 | 037403 | ISZ SBSCK       | YES, SET RETURN TO (P+2)       |
| 0062  | 03411 | 161715 | LDA ARYAD,I     | SET                            |
| 0063  | 03412 | 010445 | AND M16         | ARRAY                          |
| 0064  | 03413 | 002004 | INA             | TO                             |
| 0065  | 03414 | 171715 | STA ARYAD,I     | SINGLE SUBSCRIPT               |
| 0066  | 03415 | 060412 | LDA B2200       | RECORD A                       |
| 0067  | 03416 | 170135 | STA SBPTR,I     | LEFT BRACKET                   |
| 0068  | 03417 | 006400 | CLB             | DIM OR COM                     |
| 0069  | 03420 | 056332 | CPB DFLAG       | STATEMENT?                     |
| 0070  | 03421 | 027473 | JMP SBSCJ       | NO                             |
| 0071  | 03422 | 114221 | JSB PGINT,I     | FETCH INTEGER                  |
| 0072  | 03423 | 000460 | DEF M256        | SUBSCRIPT BOUND                |
| 0073  | 03424 | 005727 | BLF,BLF         | SAVE                           |
| 0074  | 03425 | 074161 | STB TEMP1       | BOUND                          |
| 0075  | 03426 | 007400 | CCB             | IS THE                         |
| 0076  | 03427 | 015274 | JSB SYMCK       | NEXT CHARACTER                 |
| 0077  | 03430 | 002270 | DEF SCMA-1      | A COMMA?                       |
| 0078  | 03431 | 027436 | JMP SBSC1       | NO                             |
| 0079  | 03432 | 135715 | ISZ ARYAD,I     | YES, NOTE SECOND SUBSCRIPT     |
| 0080  | 03433 | 114221 | JSB PGINT,I     | FETCH SECOND                   |
| 0081  | 03434 | 000460 | DEF M256        | INTEGER SUBSCRIPT BOUND        |
| 0082  | 03435 | 002001 | RSS             |                                |
| 0083  | 03436 | 006404 | SBSC1 CLB,INB   | SET ONE-DIMENSIONAL CASE       |
| 0084  | 03437 | 036334 | ISZ PFLAG       | COM STATEMENT?                 |
| 0085  | 03440 | 027450 | JMP SBSC2       | NO                             |
| 0086  | 03441 | 070162 | STA TEMP2       | SAVE CHARACTER                 |
| 0087  | 03442 | 060001 | LDA 1           |                                |
| 0088  | 03443 | 030161 | IOR TEMP1       | RETRIEVE FIRST BOUND           |
| 0089  | 03444 | 015336 | JSB MDIM        | FIND STORAGE NEED              |

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|      |       |        |       |            |                             |
|------|-------|--------|-------|------------|-----------------------------|
| 0090 | 03445 | 040166 | ADA   | TEMPS+7    | UPDATE COM                  |
| 0091 | 03446 | 070166 | STA   | TEMPS+7    | STORAGE POINTER             |
| 0092 | 03447 | 060162 | LDA   | TEMP2      | RETRIEVE NEXT CHARACTER     |
| 0093 | 03450 | 064432 | SBSC2 | LDB M2     | RIGHT PARENTHESIS           |
| 0094 | 03451 | 015274 | JSB   | SYMCK      | OR                          |
| 0095 | 03452 | 002264 | DEF   | RPARN-1    | RIGHT BRACKET?              |
| 0096 | 03453 | 027255 | JMP   | FSCE2      | NO                          |
| 0097 | 03454 | 060407 | LDA   | LF         | YES, RECORD A               |
| 0098 | 03455 | 170135 | STA   | SBPTR,1    | RIGHT BRACKET               |
| 0099 | 03456 | 034135 | ISZ   | SBPTR      | ADJUST S-BUFFER POINTER     |
| 0100 | 03457 | 015614 | JSB   | GETCR      | FETCH FOLLOWING             |
| 0101 | 03460 | 060334 | LDA   | .10        | CHARACTER                   |
| 0102 | 03461 | 060332 | LDB   | DFLAG      | DIM OR COM                  |
| 0103 | 03462 | 006002 | SZB   |            | STATEMENT?                  |
| 0104 | 03463 | 127403 | JMP   | SBSCCK,1   | YES                         |
| 0105 | 03464 | 017330 | JSB   | FPOP       | RESTORE FSC LOCAL VARIABLES |
| 0106 | 03465 | 064432 | LDB   | M2         | RESTORE                     |
| 0107 | 03466 | 044157 | ADB   | TEMPS      | S-STACK                     |
| 0108 | 03467 | 074157 | STB   | TEMPS      | POINTER                     |
| 0109 | 03470 | 006004 | INB   |            | FETCH                       |
| 0110 | 03471 | 164001 | LDB   | 1,1        | RETURN ADDRESS              |
| 0111 | 03472 | 124001 | JMP   | 1,1        | AND EXIT                    |
| 0112 | 03473 | 063403 | SBSC3 | LDA SBSCCK | SAVE                        |
| 0113 | 03474 | 064157 | LDB   | TEMPS      | RETURN ADDRESS              |
| 0114 | 03475 | 017371 | JSB   | SSOV       | ON S-STACK                  |
| 0115 | 03476 | 017353 | JSB   | FRCUR      | SAVE FSC LOCAL VARIABLES    |
| 0116 | 03477 | 064441 | LDB   | M9         | SET MULTIPLE STORE FLAG     |
| 0117 | 03500 | 076330 | STB   | MSFLG      | TO FALSE                    |
| 0118 | 03501 | 061715 | LDA   | ARYAD      | SAVE                        |
| 0119 | 03502 | 064157 | LDB   | TEMPS      | OPERAND                     |
| 0120 | 03503 | 017371 | JSB   | SSOV       | ADDRESS                     |
| 0121 | 03504 | 017114 | JSB   | FSC        | GET SUBSCRIPT FORMULA       |
| 0122 | 03505 | 007400 | CCB   |            | CANCEL                      |
| 0123 | 03506 | 044135 | ADB   | SBPTR      | END-OF-FORMULA              |
| 0124 | 03507 | 074135 | STB   | SBPTR      | OPERATOR                    |
| 0125 | 03510 | 064432 | LDB   | M2         | RESTORE                     |
| 0126 | 03511 | 044157 | ADB   | TEMPS      | S-STACK                     |
| 0127 | 03512 | 074157 | STB   | TEMPS      | POINTER                     |
| 0128 | 03513 | 006004 | INB   |            | RESTORE                     |
| 0129 | 03514 | 164001 | LDB   | 1,1        | OPERAND                     |
| 0130 | 03515 | 075715 | STB   | ARYAD      | ADDRESS                     |
| 0131 | 03516 | 007400 | CCB   |            | IS THE                      |
| 0132 | 03517 | 015274 | JSB   | SYMCK      | NEXT CHARACTER              |
| 0133 | 03520 | 002270 | DEF   | SCMMA-1    | A COMMA?                    |
| 0134 | 03521 | 027450 | JMP   | SBSC2      | NO                          |
| 0135 | 03522 | 135715 | ISZ   | ARYAD,1    | YES, NOTE SECOND SUBSCRIPT  |
| 0136 | 03523 | 017114 | JSB   | FSC        | GET SUBSCRIPT FORMULA       |
| 0137 | 03524 | 007400 | CCB   |            | CANCEL                      |
| 0138 | 03525 | 044135 | ADB   | SBPTR      | END-OF-FORMULA              |
| 0139 | 03526 | 074135 | STB   | SBPTR      | OPERATOR                    |
| 0140 | 03527 | 027450 | JMP   | SBSC2      |                             |

0142\*\*

0143\*\*\* CHECK SYNTAX OF ARRAY DEFINITIONS \*\*

0144\*\*

|      |       |        |       |             |                        |
|------|-------|--------|-------|-------------|------------------------|
| 0145 | 03530 | 000000 | ARRYS | NOP         |                        |
| 0146 | 03531 | 017544 |       | JSB ARRID   | FETCH ARRAY IDENTIFIER |
| 0147 | 03532 | 017403 |       | JSB SBSCK   | RECORD A SUBSCRIPT     |
| 0148 | 03533 | 014477 |       | JSB ERROR   | MISSING SUBSCRIPT      |
| 0149 | 03534 | 050334 | ARRE1 | CPA .10     | END-OF-STATEMENT?      |
| 0150 | 03535 | 127530 |       | JMP ARYS,I  | YES, RETURN VIA (P+1)  |
| 0151 | 03536 | 007400 |       | CCB         | NO,                    |
| 0152 | 03537 | 015274 |       | JSB SYMCK   | MUST BE                |
| 0153 | 03540 | 002260 |       | DEF COMMA-1 | A COMMA                |
| 0154 | 03541 | 024266 |       | JMP NOEOF   | ISN'T                  |
| 0155 | 03542 | 037530 |       | ISZ ARYS    | IS, RETURN             |
| 0156 | 03543 | 127530 |       | JMP ARYS,I  | VIA (P+2)              |

0157\*\*

0158\*\*\* FETCH ARRAY IDENTIFIER \*\*

0159\*\*

|      |       |        |       |             |                              |
|------|-------|--------|-------|-------------|------------------------------|
| 0160 | 03544 | 000000 | ARRID | NOP         |                              |
| 0161 | 03545 | 017635 |       | JSB LTR     | FETCH LETTER                 |
| 0162 | 03546 | 014477 |       | JSB ERROR   | NONE FOUND                   |
| 0163 | 03547 | 060135 | ARRE2 | LDA SBPTR   | SAVE                         |
| 0164 | 03550 | 071715 |       | STA ARYAD   | OPERAND ADDRESS              |
| 0165 | 03551 | 060161 |       | LDA TEMP1   | RECORD                       |
| 0166 | 03552 | 064355 |       | LDB .46     | ARRAY                        |
| 0167 | 03553 | 017650 |       | JSB STROP   | IDENTIFIER                   |
| 0168 | 03554 | 060162 |       | LDA TEMP2   | RETRIEVE FOLLOWING CHARACTER |
| 0169 | 03555 | 127544 |       | JMP ARRID,I |                              |

0170\*\*

0171\*\*\* CHECK FOR VARIABLE OPERAND \*\*

0172\*\*

|      |       |        |       |             |                              |
|------|-------|--------|-------|-------------|------------------------------|
| 0173 | 03556 | 000000 | VAROP | NOP         |                              |
| 0174 | 03557 | 017635 |       | JSB LTR     | LETTER?                      |
| 0175 | 03560 | 127556 |       | JMP VAROP,I | NO, EXIT VIA (P+1)           |
| 0176 | 03561 | 037556 |       | ISZ VAROP   |                              |
| 0177 | 03562 | 050351 |       | CPA .40     | LEFT PARENTHESIS?            |
| 0178 | 03563 | 027624 |       | JMP VAR05   | YES                          |
| 0179 | 03564 | 050373 |       | CPA B133    | NO, LEFT BRACKET?            |
| 0180 | 03565 | 027624 |       | JMP VAR05   | YES                          |
| 0181 | 03566 | 037556 |       | ISZ VAROP   | NO                           |
| 0182 | 03567 | 015570 |       | JSB DIGCK   | DIGIT?                       |
| 0183 | 03570 | 027600 |       | JMP VAR01   | NO                           |
| 0184 | 03571 | 060161 |       | LDA TEMP1   | YES, RETRIEVE LETTER,        |
| 0185 | 03572 | 044357 |       | ADB .48     | AND RESTORE ASCII DIGIT      |
| 0186 | 03573 | 074161 |       | STB TEMP1   |                              |
| 0187 | 03574 | 017650 |       | JSB STROP   | RECORD VARIABLE              |
| 0188 | 03575 | 015614 |       | JSB GETCR   | FETCH FOLLOWING              |
| 0189 | 03576 | 060334 |       | LDA .10     | CHARACTER                    |
| 0190 | 03577 | 027604 |       | JMP VAR02   |                              |
| 0191 | 03600 | 060161 | VAR01 | LDA TEMP1   | RETRIEVE LETTER,             |
| 0192 | 03601 | 064356 |       | LDB .47     | SET 'NO DIGIT',              |
| 0193 | 03602 | 017650 |       | JSB STROP   | AND RECORD VARIABLE          |
| 0194 | 03603 | 060162 |       | LDA TEMP2   | RETRIEVE FOLLOWING CHARACTER |
| 0195 | 03604 | 070162 | VAR02 | STA TEMP2   | SAVE CHARACTER               |
| 0196 | 03605 | 006400 |       | CLB         | INSIDE A                     |
| 0197 | 03606 | 056334 |       | CPB PFLAG   | DEF STATEMENT?               |

PAGE 0062 #04 CHECK SYNTAX AND TRANSLITERATE

|         |                       |        |       |             |                                |
|---------|-----------------------|--------|-------|-------------|--------------------------------|
| 0198    | 03607                 | 127556 |       | JMP VAROP,I | NO, EXIT VIA (P+3)             |
| 0199    | 03610                 | 007400 |       | CCB         |                                |
| 0200    | 03611                 | 044135 |       | ADB SBPTR   | RETRIEVE                       |
| 0201    | 03612                 | 160001 |       | LDA 1,I     |                                |
| 0202    | 03613                 | 010401 |       | AND MSK1    | OPERAND                        |
| 0203    | 03614                 | 052334 |       | CPA PFLAG   | MATCH PARAMETER?               |
| 0204    | 03615                 | 027620 |       | JMP VAR04   | YES                            |
| 0205    | 03616                 | 060162 | VAR03 | LDA TEMP2   | NO, RETRIEVE                   |
| 0206    | 03617                 | 127556 |       | JMP VAROP,I | CHARACTER AND EXIT VIA (P+3)   |
| 0207    | 03620                 | 160001 | VAR04 | LDA 1,I     | SET OPERAND TO                 |
| 0208    | 03621                 | 030470 |       | IOR FLGBT   | ACTUAL PARAMETER               |
| 0209    | 03622                 | 170001 |       | STA 1,I     | AND RECORD IT                  |
| 0210    | 03623                 | 027616 |       | JMP VAR03   |                                |
| 0211    | 03624                 | 060135 | VAR05 | LDA SBPTR   | SAVE                           |
| 0212    | 03625                 | 071715 |       | STA ARYAJ   | OPERAND ADDRESS                |
| 0213    | 03626                 | 060161 |       | LDA TEMP1   | RETRIEVE LETTER                |
| 0214    | 03627                 | 064355 |       | LDB .46     | RECORD                         |
| 0215    | 03630                 | 017650 |       | JSB STROP   | ARRAY IDENTIFIER               |
| 0216    | 03631                 | 060373 |       | LDA B133    | RETRIEVE LEFT BRACKET          |
| 0217    | 03632                 | 017403 |       | JSB SBSCK   | FETCH SUBSCRIPT                |
| 0218    | 03633                 | 000000 |       | NOP         |                                |
| 0219    | 03634                 | 127556 |       | JMP VAROP,I | EXIT VIA (P+2)                 |
| 0220**  |                       |        |       |             |                                |
| 0221*** | FETCH A LETTER        | **     |       |             |                                |
| 0222**  |                       |        |       |             |                                |
| 0223    | 03635                 | 000000 | LTR   | NOP         |                                |
| 0224    | 03636                 | 015614 |       | JSB GETCR   |                                |
| 0225    | 03637                 | 060334 |       | LDA .10     |                                |
| 0226    | 03640                 | 015603 |       | JSB LETCK   | LETTER?                        |
| 0227    | 03641                 | 127635 |       | JMP LTR,I   | NO, EXIT VIA (P+1)             |
| 0228    | 03642                 | 037635 |       | ISZ LTR     | YES,                           |
| 0229    | 03643                 | 070161 |       | STA TEMP1   | SAVE IT                        |
| 0230    | 03644                 | 015614 |       | JSB GETCR   | NEXT CHARACTER                 |
| 0231    | 03645                 | 060334 |       | LDA .10     | TO (A)                         |
| 0232    | 03646                 | 070162 |       | STA TEMP2   | SAVE SECOND CHARACTER          |
| 0233    | 03647                 | 127635 |       | JMP LTR,I   | EXIT VIA (P+2)                 |
| 0234**  |                       |        |       |             |                                |
| 0235*** | STORE AN OPERAND NAME | **     |       |             |                                |
| 0236**  |                       |        |       |             |                                |
| 0237    | 03650                 | 000000 | STROP | NOP         | LETTER IN (A), NUMBER IN (B)   |
| 0238    | 03651                 | 040453 |       | ADA D100    | NUMERICALLY ADJUST THE         |
| 0239    | 03652                 | 044451 |       | ADB D53     | OPERAND NAME                   |
| 0240    | 03653                 | 001700 |       | ALF         | COMBINE THE                    |
| 0241    | 03654                 | 030001 |       | IOR 1       | TWO PARTS                      |
| 0242    | 03655                 | 130135 |       | IOR SBPTR,I | COMPLETE OPERAND-OPERATOR PAIR |
| 0243    | 03656                 | 170135 |       | STA SBPTR,I | AND STORE IT                   |
| 0244    | 03657                 | 034135 |       | ISZ SBPTR   | UPDATE S-BUFFER POINTER        |
| 0245    | 03660                 | 127650 |       | JMP STROP,I |                                |

0247\*\*

0248\*\*\* CHECK FOR LEFT PARENTHESIS \*\*

0249\*\*

|      |       |        |      |             |                  |
|------|-------|--------|------|-------------|------------------|
| 0250 | 03661 | 000000 | LPCK | NOP         | CHARACTER IN (A) |
| 0251 | 03662 | 064432 |      | LDB M2      | LEFT PARENTHESIS |
| 0252 | 03663 | 015274 |      | JSB SYMCK   | OR               |
| 0253 | 03664 | 002320 |      | DEF LBRAC-1 | LEFT BRACKET?    |
| 0254 | 03665 | 027201 |      | JMP FSCE1   | NO               |
| 0255 | 03666 | 060413 |      | LDA B2300   | YES, RECORD A    |
| 0256 | 03667 | 170135 |      | STA SBPTR,1 | LEFT PARENTHESIS |
| 0257 | 03670 | 127661 |      | JMP LPCK,1  | EXIT             |

0258\*\*

0259\*\*\* CHECK FOR RIGHT PARENTHESIS \*\*

0260\*\*

|      |       |        |      |             |                              |
|------|-------|--------|------|-------------|------------------------------|
| 0261 | 03671 | 000000 | RPCK | NOP         |                              |
| 0262 | 03672 | 064432 |      | LDB M2      | RIGHT PARENTHESIS            |
| 0263 | 03673 | 015274 |      | JSB SYMCK   | OR                           |
| 0264 | 03674 | 002264 |      | DEF RPARN-1 | RIGHT BRACKET?               |
| 0265 | 03675 | 027255 |      | JMP FSCE2   | NO                           |
| 0266 | 03676 | 060406 |      | LDA B4000   | YES, RECORD A                |
| 0267 | 03677 | 170135 |      | STA SBPTR,1 | RIGHT PARENTHESIS            |
| 0268 | 03700 | 034135 |      | ISZ SBPTR   | UPDATE SYNTAX BUFFER POINTER |
| 0269 | 03701 | 015614 |      | JSB GETCH   | FETCH                        |
| 0270 | 03702 | 060334 |      | LDA .10     | FOLLOWING CHARACTER          |
| 0271 | 03703 | 127671 |      | JMP RPCK,1  |                              |

0272\*\*

0273\*\*\* FETCH MAT STATEMENT SUBSCRIPT \*\*

0274\*\*

|      |       |        |       |             |                         |
|------|-------|--------|-------|-------------|-------------------------|
| 0275 | 03704 | 000000 | MATSB | NOP         |                         |
| 0276 | 03705 | 064432 |       | LDB M2      | LEFT PARENTHESIS        |
| 0277 | 03706 | 015274 |       | JSB SYMCK   | OR                      |
| 0278 | 03707 | 002320 |       | DEF LBRAC-1 | LEFT BRACKET?           |
| 0279 | 03710 | 127704 |       | JMP MATSB,1 | NO                      |
| 0280 | 03711 | 037704 |       | ISZ MATSB   | YES, SET RETURN ADDRESS |
| 0281 | 03712 | 060412 |       | LDA B2200   | RECORD A                |
| 0282 | 03713 | 170135 |       | STA SBPTR,1 | LEFT BRACKET            |
| 0283 | 03714 | 017114 |       | JSB FSC     | FETCH SUBSCRIPT         |
| 0284 | 03715 | 007400 |       | CCB         |                         |
| 0285 | 03716 | 015274 |       | JSB SYMCK   | COMMA?                  |
| 0286 | 03717 | 002260 |       | DEF COMMA-1 |                         |
| 0287 | 03720 | 002001 |       | RSS         | NO                      |
| 0288 | 03721 | 017114 |       | JSB FSC     | YES, FETCH SUBSCRIPT    |
| 0289 | 03722 | 064432 |       | LDB M2      | RIGHT PARENTHESIS       |
| 0290 | 03723 | 015274 |       | JSB SYMCK   | OR                      |
| 0291 | 03724 | 002264 |       | DEF RPARN-1 | RIGHT BRACKET           |
| 0292 | 03725 | 027255 |       | JMP FSCE2   |                         |
| 0293 | 03726 | 060407 |       | LDA LF      | RECORD A                |
| 0294 | 03727 | 170135 |       | STA SBPTR,1 | RIGHT BRACKET           |
| 0295 | 03730 | 034135 |       | ISZ SBPTR   |                         |
| 0296 | 03731 | 015614 |       | JSB GETCH   | END-OF-STATEMENT?       |
| 0297 | 03732 | 124252 |       | JMP ACCST,1 | YES                     |
| 0298 | 03733 | 127704 |       | JMP MATSB,1 |                         |

0300\*\*

0301\*\*\* FETCH PARENTHESIZED FORMULA \*\*

0302\*\*

|      |       |        |       |         |                        |
|------|-------|--------|-------|---------|------------------------|
| 0303 | 03734 | 000000 | GETPF | NOP     |                        |
| 0304 | 03735 | 015614 | JSB   | GETCR   |                        |
| 0305 | 03736 | 024265 | JMP   | EOF     |                        |
| 0306 | 03737 | 034135 | ISZ   | SBPTR   |                        |
| 0307 | 03740 | 017661 | JSB   | LPCK    | FETCH LEFT PARENTHESIS |
| 0308 | 03741 | 017114 | JSB   | FSC     | FETCH FORMULA          |
| 0309 | 03742 | 017671 | JSB   | RPCK    | GET RIGHT PARENTHESIS  |
| 0310 | 03743 | 127734 | JMP   | GETPF,I |                        |

0311\*\*

0312\*\*\* FLAG OPERATOR WHICH PRECEDES NUMBER \*\*

0313\*\*

|      |       |        |       |         |                  |
|------|-------|--------|-------|---------|------------------|
| 0314 | 03744 | 000000 | NUMOP | NOP     |                  |
| 0315 | 03745 | 070164 | STA   | TEMP4   |                  |
| 0316 | 03746 | 064433 | LDB   | M3      | FETCH            |
| 0317 | 03747 | 044135 | ADB   | SBPTR   | PRECEDING        |
| 0318 | 03750 | 160001 | LDA   | 1,I     | OPERATOR         |
| 0319 | 03751 | 030470 | IOR   | FLGBT   | ADD FLAG BIT     |
| 0320 | 03752 | 170001 | STA   | 1,I     | REPLACE OPERATOR |
| 0321 | 03753 | 060164 | LDA   | TEMP4   |                  |
| 0322 | 03754 | 127744 | JMP   | NUMOP,I |                  |



```

0324*
0325*   SYSTEM COMMAND TABLE
0326*
0327  03755 000003 SYCMD OCT 00003
0328  03756 051125      ASC 2,RUN      EXECUTE PROGRAM
0329*
0330  03760 002003      OCT 02003
0331  03761 051503      ASC 2,SCR      SCRATCH PROGRAM
0332*
0333  03763 003004      OCT 03004
0334  03764 046111      ASC 2,LIST     LIST COMMAND
0335*
0336  03766 005005      OCT 05005
0337  03767 050114      ASC 3,PLIST    PUNCH LIST COMMAND
0338*
0339  03772 012003      OCT 12003
0340  03773 050124      ASC 2,PTA      ACTIVATE PHOTO-READER
0341*
0342  03775 033004      OCT 33004
0343  03776 051524 STCMD ASC 2,STOP    ABORT CURRENT ACTIVITY
0344*
0345  04000 046003      OCT 46003
0346  04001 052101      ASC 2,TAP      ACTIVATE TTY TAPE MODE
0347*
0348  04003 050003      OCT 50003
0349  04004 041131      ASC 2,BYE      EXIT SYSTEM
0350**
0351*** PRINT NAME TABLE FOR OPERATORS **
0352**
0353  04006 032003 LET   OCT 32003      BITS 15-9 OF THE LABELLED WORD
0354  04007 046105      ASC 2,LET
0355  04011 033003 DIM   OCT 33003      ARE THE BASIC CODE OPERATOR
0356  04012 042111      ASC 2,DIM
0357  04014 034003 COM   OCT 34003      NUMBERS. BITS 2-0 ARE THE
0358  04015 041517      ASC 2,COM
0359  04017 035003 DEF   OCT 35003      LENGTH IN CHARACTERS OF THE
0360  04020 042105      ASC 2,DEF
0361  04022 036003 REM   OCT 36003      SYMBOL. THE ASCII VERSION OF
0362  04023 051105      ASC 2,REM
0363  04025 037004 GOTO  OCT 37004      THE SYMBOL FOLLOWS.
0364  04026 043517      ASC 2,GOTO
0365  04030 040002 IF    OCT 40002
0366  04031 044506      ASC 1,IF
0367  04032 041003 FOR   OCT 41003
0368  04033 043117      ASC 2,FOR
0369  04035 042004 NEXT  OCT 42004
0370  04036 047105      ASC 2,NEXT
0371  04040 043005 GOSUB OCT 43005
0372  04041 043517      ASC 3,GOSUB
0373  04044 044006 RTRN  OCT 44006
0374  04045 051105      ASC 3,RETURN
0375  04050 045003 END   OCT 45003
0376  04051 042516      ASC 2,END
0377  04053 046004 STF   OCT 46004
0378  04054 051524      ASC 2,STOP
0379  04056 047004 WAIT  OCT 47004

```

|       |       |        |        |                |
|-------|-------|--------|--------|----------------|
| 0380  | 04057 | 053501 |        | ASC 2, WAIT    |
| 0381  | 04061 | 050004 | CALL   | OCT 50004      |
| 0382  | 04062 | 041501 |        | ASC 2, CALL    |
| 0383  | 04064 | 051004 | DATA   | OCT 51004      |
| 0384  | 04065 | 042101 |        | ASC 2, DATA    |
| 0385  | 04067 | 052004 | READ   | OCT 52004      |
| 0386  | 04070 | 051105 |        | ASC 2, READ    |
| 0387  | 04072 | 053005 | PRINT  | OCT 53005      |
| 0388  | 04073 | 050122 |        | ASC 3, PRINT   |
| 0389  | 04076 | 054005 | INPUT  | OCT 54005      |
| 0390  | 04077 | 044516 |        | ASC 3, INPUT   |
| 0391  | 04102 | 055007 | RESTOR | OCT 55007      |
| 0392  | 04103 | 051105 |        | ASC 4, RESTORE |
| 0393  | 04107 | 056003 | MAT    | OCT 56003      |
| 0394  | 04110 | 046501 |        | ASC 2, MAT     |
| 0395  | 04112 | 057004 | THEN   | OCT 57004      |
| 0396  | 04113 | 052110 |        | ASC 2, THEN    |
| 0397  | 04115 | 060002 | TO     | OCT 60002      |
| 0398  | 04116 | 052117 |        | ASC 1, TO      |
| 0399  | 04117 | 061004 | STEP   | OCT 61004      |
| 0400  | 04120 | 051524 |        | ASC 2, STEP    |
| 0401  | 04122 | 027003 | NOT    | OCT 27003      |
| 0402  | 04123 | 047117 |        | ASC 2, NOT     |
| 0403  | 04125 | 026003 | AND    | OCT 26003      |
| 0404  | 04126 | 040516 |        | ASC 2, AND     |
| 0405  | 04130 | 025002 | OR     | OCT 25002      |
| 0406  | 04131 | 047522 |        | ASC 1, OR      |
| 0407  | 04132 | 030002 | GTE    | OCT 30002      |
| 0408  | 04133 | 037075 |        | ASC 1, >=      |
| 0409  | 04134 | 031002 | LTE    | OCT 31002      |
| 0410  | 04135 | 036075 |        | ASC 1, <=      |
| 0411  | 04136 | 017002 | AUNEQ  | OCT 17002      |
| 0412  | 04137 | 036076 |        | ASC 1, <>      |
| 0413* |       |        |        |                |
| 0414  | 04140 | 001003 | TAB    | OCT 1003       |
| 0415  | 04141 | 052101 |        | ASC 2, TAB     |
| 0416  | 04143 | 002003 | SIN    | OCT 2003       |
| 0417  | 04144 | 051511 |        | ASC 2, SIN     |
| 0418  | 04146 | 003003 | COS    | OCT 3003       |
| 0419  | 04147 | 041517 |        | ASC 2, COS     |
| 0420  | 04151 | 004003 | TAN    | OCT 4003       |
| 0421  | 04152 | 052101 |        | ASC 2, TAN     |
| 0422  | 04154 | 005003 | ATN    | OCT 5003       |
| 0423  | 04155 | 040524 |        | ASC 2, ATN     |
| 0424  | 04157 | 006003 | EXP    | OCT 6003       |
| 0425  | 04160 | 042530 |        | ASC 2, EXP     |
| 0426  | 04162 | 007003 | LOG    | OCT 7003       |
| 0427  | 04163 | 046117 |        | ASC 2, LOG     |
| 0428  | 04165 | 010003 | ABS    | OCT 10003      |
| 0429  | 04166 | 040502 |        | ASC 2, ABS     |
| 0430  | 04170 | 011003 | SQR    | OCT 11003      |
| 0431  | 04171 | 051521 |        | ASC 2, SQR     |
| 0432  | 04173 | 012003 | INT    | OCT 12003      |
| 0433  | 04174 | 044516 |        | ASC 2, INT     |
| 0434  | 04176 | 013003 | RND    | OCT 13003      |
| 0435  | 04177 | 051116 |        | ASC 2, RND     |

ALTERNATE UNEQUAL SIGN

THIS SECTION HAS THE PRE-DEFINED  
FUNCTIONS. HERE BITS 13-9 ARE  
THE IDENTIFYING NUMBER OF THE  
FUNCTION.

|  |       |        |       |             |                            |
|--|-------|--------|-------|-------------|----------------------------|
| 0436   | 04201 | 014003 | SGN   | OCT 14003   |                            |
| 0437   | 04202 | 051507 |       | ASC 2,SGN   |                            |
| 0438   | 04204 | 015003 | ZER   | OCT 15003   | MATRIX FUNCTIONS           |
| 0439   | 04205 | 055105 |       | ASC 2,ZER   |                            |
| 0440   | 04207 | 016003 | CON   | OCT 16003   |                            |
| 0441   | 04210 | 041517 |       | ASC 2,CON   |                            |
| 0442   | 04212 | 017003 | IDN   | OCT 17003   |                            |
| 0443   | 04213 | 044504 |       | ASC 2,IDN   |                            |
| 0444   | 04215 | 020003 | INV   | OCT 20003   |                            |
| 0445   | 04216 | 044516 |       | ASC 2,INV   |                            |
| 0446   | 04220 | 021003 | TRN   | OCT 21003   |                            |
| 0447   | 04221 | 052122 |       | ASC 2,TRN   |                            |
| 0448**   |       |        |       |             |                            |
| 0449*** TABLE SEARCH FOR MULTICHARACTER SYMBOLS ** |       |        |       |             |                            |
| 0450**   |       |        |       |             |                            |
| 0451   | 04223 | 000000 | TBSRM | NOP         |                            |
| 0452   | 04224 | 072333 |       | STA TABLE   | STORE TABLE ADDRESS        |
| 0453   | 04225 | 074167 |       | STB LNTH    | STORE -(NUMBER OF ENTRIES) |
| 0454   | 04226 | 060132 |       | LDA BADDR   | SAVE                       |
| 0455   | 04227 | 070163 |       | STA TEMP3   | INPUT                      |
| 0456   | 04230 | 060133 |       | LDA CCNT    | BUFFER                     |
| 0457   | 04231 | 070164 |       | STA TEMP4   | STATUS                     |
| 0458   | 04232 | 060135 |       | LDA SBPTR   | INITIALIZE END-OF-SYMBOL   |
| 0459   | 04233 | 072351 |       | STA SMEND   | POINTER                    |
| 0460   | 04234 | 002404 |       | CLA,INA     | COUNT FIRST CHARACTER OF   |
| 0461   | 04235 | 072556 |       | STA SLENG   | SYMBOL                     |
| 0462   | 04236 | 160135 |       | LDA SBPTR,I | FETCH PARTIAL SYMBOL       |
| 0463   | 04237 | 010374 |       | AND B177    | TWO                        |
| 0464   | 04240 | 150135 |       | CPA SBPTR,I | CHARACTERS?                |
| 0465   | 04241 | 002001 |       | RSS         | NO                         |
| 0466   | 04242 | 026265 |       | JMP TSR10   | YES                        |
| 0467   | 04243 | 001727 |       | ALF,ALF     | LEFT-JUSTIFY               |
| 0468   | 04244 | 030345 |       | IOR .32     | FIRST CHARACTER AND        |
| 0469   | 04245 | 170135 |       | STA SBPTR,I | APPEND BLANK               |
| 0470   | 04246 | 015614 | TSRC1 | JSB GETCR   | FETCH NEXT CHARACTER       |
| 0471   | 04247 | 026326 |       | JMP TSRC9   | END-OF-STATEMENT           |
| 0472   | 04250 | 066556 |       | LDB SLENG   | CHECK FOR                  |
| 0473   | 04251 | 054331 |       | CPB .7      | IMPOSSIBLE LENGTH          |
| 0474   | 04252 | 026326 |       | JMP TSRC9   |                            |
| 0475   | 04253 | 004010 |       | SLB         | EVEN-NUMBERED CHARACTER?   |
| 0476   | 04254 | 026262 |       | JMP TSRC2   | YES                        |
| 0477   | 04255 | 036351 |       | ISZ SMEND   | NO, FETCH FRESH WORD,      |
| 0478   | 04256 | 001727 |       | ALF,ALF     | LEFT-JUSTIFY CHARACTER,    |
| 0479   | 04257 | 030345 |       | IOR .32     | APPEND BLANK,              |
| 0480   | 04260 | 172351 |       | STA SMEND,I | AND STORE                  |
| 0481   | 04261 | 026265 |       | JMP TSR10   |                            |
| 0482   | 04262 | 040450 | TSRC2 | ADA M32     | DELETE BLANK,              |
| 0483   | 04263 | 142351 |       | ADA SMEND,I | FILL SECOND CHARACTER,     |
| 0484   | 04264 | 172351 |       | STA SMEND,I | AND STORE                  |
| 0485   | 04265 | 036556 | TSR10 | ISZ SLENG   | COUNT IT                   |
| 0486   | 04266 | 064167 |       | LDB LNTH    | INITIALIZE TABLE LENGTH    |
| 0487   | 04267 | 074165 |       | STB COUNT   | COUNTER                    |
| 0488   | 04270 | 062333 |       | LDA TABLE   |                            |
| 0489   | 04271 | 072513 | TSRC3 | STA TBLPT   | SET TABLE POINTER          |
| 0490   | 04272 | 162513 |       | LDA TBLPT,I | EXTRACT SYMBOL LENGTH      |
| 0491   | 04273 | 010331 |       | AND .7      | FROM TABLE AND COMPARE     |

|         |                                     |        |       |              |                           |
|---------|-------------------------------------|--------|-------|--------------|---------------------------|
| 0492    | 04274                               | 052556 | CPA   | SLENG        | WITH CURRENT SYMBOL       |
| 0493    | 04275                               | 026304 | JMP   | TSRC5        | EQUAL?                    |
| 0494    | 04276                               | 040326 | TSRC4 | ADA .3       | DIFFERENT,                |
| 0495    | 04277                               | 001100 | ARS   |              | UPDATE                    |
| 0496    | 04300                               | 042513 | ADA   | TBLPT        | TABLE POINTER             |
| 0497    | 04301                               | 034165 | ISZ   | COUNT        | MORE ENTRIES?             |
| 0498    | 04302                               | 026271 | JMP   | TSRC3        | YES                       |
| 0499    | 04303                               | 026246 | JMP   | TSRC1        | NO                        |
| 0500    | 04304                               | 066513 | TSRC5 | LDB TBLPT    | SET POINTER TO            |
| 0501    | 04305                               | 076537 | STB   | TSPTR        | TABLE SYMBOL              |
| 0502    | 04306                               | 064135 | LDB   | SBPTR        | SET (B) TO INPUT          |
| 0503    | 04307                               | 026313 | JMP   | TSRC7        | SYMBOL POINTER            |
| 0504    | 04310                               | 056351 | TSRC6 | CPB SMEND    | ALL OF SYMBOL CONSIDERED? |
| 0505    | 04311                               | 026321 | JMP   | TSRC8        | YES, MATCH OCCURRED       |
| 0506    | 04312                               | 006004 | INB   |              | NO, INCREMENT             |
| 0507    | 04313                               | 036537 | TSRC7 | ISZ TSPTR    | SYMBOL POINTERS           |
| 0508    | 04314                               | 162537 | LDA   | TSPTR, I     | FETCH WORD FROM TABLE     |
| 0509    | 04315                               | 150001 | CPA   | 1, I         | MATCH WITH INPUT SYMBOL?  |
| 0510    | 04316                               | 026310 | JMP   | TSRC6        | YES                       |
| 0511    | 04317                               | 062556 | LDA   | SLENG        | NO, WRONG                 |
| 0512    | 04320                               | 026276 | JMP   | TSRC4        | SYMBOL                    |
| 0513    | 04321                               | 162513 | TSRC8 | LDA TBLPT, I | EXTRACT                   |
| 0514    | 04322                               | 010420 | AND   | OPMSK        | SYMBOL CODE               |
| 0515    | 04323                               | 170135 | STA   | SBPTR, I     |                           |
| 0516    | 04324                               | 036223 | ISZ   | TBSRH        | AND RETURN VIA            |
| 0517    | 04325                               | 126223 | JMP   | TBSRH, I     | 'SUCCESS' EXIT            |
| 0518    | 04326                               | 060163 | TSRC9 | LDA TEMP3    | RESTORE                   |
| 0519    | 04327                               | 070132 | STA   | BADDR        | INPUT                     |
| 0520    | 04330                               | 060164 | LDA   | TEMP4        | BUFFER                    |
| 0521    | 04331                               | 070133 | STA   | CCNT         | STATUS                    |
| 0522    | 04332                               | 126223 | JMP   | TBSRH, I     | 'FAILURE' EXIT            |
| 0523**  |                                     |        |       |              |                           |
| 0524*** | FETCH AND RECORD PROGRAM INTEGER ** |        |       |              |                           |
| 0525**  |                                     |        |       |              |                           |
| 0526    | 04333                               | 000000 | PRGIN | NOP          |                           |
| 0527    | 04334                               | 160135 | LDA   | SBPTR, I     | SET                       |
| 0528    | 04335                               | 030470 | IOR   | FL0BT        | 'INTEGER                  |
| 0529    | 04336                               | 040326 | ADA   | .3           | FOLLOWS'                  |
| 0530    | 04337                               | 170135 | STA   | SBPTR, I     | OPERAND                   |
| 0531    | 04340                               | 162333 | LDA   | PRGIN, I     | GIVE ADDRESS              |
| 0532    | 04341                               | 072346 | STA   | PRGI1        | TO INTCK                  |
| 0533    | 04342                               | 034135 | ISZ   | SBPTR        |                           |
| 0534    | 04343                               | 015614 | JSB   | GETCK        |                           |
| 0535    | 04344                               | 014477 | SYE25 | JSB ERROR    |                           |
| 0536    | 04345                               | 016351 | JSB   | INTCK        | FETCH                     |
| 0537    | 04346                               | 000000 | PRGI1 | NOP          |                           |
| 0538    | 04347                               | 036333 | ISZ   | PRGIN        |                           |
| 0539    | 04350                               | 126333 | JMP   | PRGIN, I     |                           |
| 0540**  |                                     |        |       |              |                           |
| 0541*** | BUILD AN INTEGER **                 |        |       |              |                           |
| 0542**  |                                     |        |       |              |                           |
| 0543    | 04351                               | 000000 | INTCK | NOP          | CHARACTER IN (A)          |
| 0544    | 04352                               | 006400 | CLB   |              | STORE                     |
| 0545    | 04353                               | 076556 | STB   | INTGR        | PARTIAL RESULT            |
| 0546    | 04354                               | 015570 | INTC1 | JSB DIGCK    | DIGIT?                    |
| 0547    | 04355                               | 026373 | JMP   | INTC2        | NO                        |

|         |                          |        |                 |                             |
|---------|--------------------------|--------|-----------------|-----------------------------|
| 0548    | 04356                    | 103101 | CLO             |                             |
| 0549    | 04357                    | 066556 | LDB INTGR       | MULTIPLY                    |
| 0550    | 04360                    | 044001 | ADB 1           | PARTIAL                     |
| 0551    | 04361                    | 044001 | ADB 1           | RESULT                      |
| 0552    | 04362                    | 046556 | ADB INTGR       | BY                          |
| 0553    | 04363                    | 044001 | ADB 1           | 10                          |
| 0554    | 04364                    | 044000 | ADB 0           | ADD LATEST DIGIT            |
| 0555    | 04365                    | 102201 | SOC             | OVERFLOW?                   |
| 0556    | 04366                    | 026344 | JMP SYE25       | YES                         |
| 0557    | 04367                    | 076556 | STB INTGR       | STORE PARTIAL RESULT        |
| 0558    | 04370                    | 015614 | JSB GETCR       | NO, FETCH                   |
| 0559    | 04371                    | 060334 | LDA .10         | NEXT CHARACTER              |
| 0560    | 04372                    | 026354 | JMP INTC1       |                             |
| 0561    | 04373                    | 066556 | INTC2 LDB INTGR | ZERO                        |
| 0562    | 04374                    | 006003 | SZB,RSS         | INTEGER?                    |
| 0563    | 04375                    | 026344 | JMP SYE25       | YES                         |
| 0564    | 04376                    | 174135 | STB SBPTR,I     | NO, RECORD IT               |
| 0565    | 04377                    | 166351 | LDB INTCK,I     | INTEGER                     |
| 0566    | 04400                    | 164001 | LDB 1,I         | TOO                         |
| 0567    | 04401                    | 046556 | ADB INTGR       | LARGE?                      |
| 0568    | 04402                    | 006021 | SSB,RSS         |                             |
| 0569    | 04403                    | 026344 | JMP SYE25       | YES                         |
| 0570    | 04404                    | 066556 | LDB INTGR       | NO,                         |
| 0571    | 04405                    | 034135 | ISZ SBPTR       | RETURN WITH                 |
| 0572    | 04406                    | 036351 | ISZ INTCK       | INTEGER                     |
| 0573    | 04407                    | 126351 | JMP INTCK,I     | IN (B)                      |
| 0574**  |                          |        |                 |                             |
| 0575*** | PROCESS CHARACTER STRING | **     |                 |                             |
| 0576**  |                          |        |                 |                             |
| 0577    | 04410                    | 000000 | CHRST NOP       |                             |
| 0578    | 04411                    | 070162 | STA TEMP2       | RECORD TERMINATOR CHARACTER |
| 0579    | 04412                    | 060334 | LDA .10         | DUMMY                       |
| 0580    | 04413                    | 070476 | STA BLANK       | DELETE CHARACTER            |
| 0581    | 04414                    | 015614 | CHRS1 JSB GETCR |                             |
| 0582    | 04415                    | 026433 | JMP CHRS3       | TO END-OF-STATEMENT EXIT    |
| 0583    | 04416                    | 050162 | CPA TEMP2       | TERMINATOR CHARACTER?       |
| 0584    | 04417                    | 026432 | JMP CHRS2       | YES                         |
| 0585    | 04420                    | 130135 | IOR SBPTR,I     | NO, FILL                    |
| 0586    | 04421                    | 170135 | STA SBPTR,I     | SECOND CHARACTER            |
| 0587    | 04422                    | 015614 | JSB GETCR       |                             |
| 0588    | 04423                    | 026433 | JMP CHRS3       | TO END-OF-STATEMENT EXIT    |
| 0589    | 04424                    | 050162 | CPA TEMP2       | TERMINATOR CHARACTER?       |
| 0590    | 04425                    | 026432 | JMP CHRS2       | YES                         |
| 0591    | 04426                    | 034135 | ISZ SBPTR       | NO, MOVE TO NEW WORD        |
| 0592    | 04427                    | 001727 | ALF,ALF         | AND STORE                   |
| 0593    | 04430                    | 170135 | STA SBPTR,I     | FIRST CHARACTER             |
| 0594    | 04431                    | 026414 | JMP CHRS1       |                             |
| 0595    | 04432                    | 036410 | CHRS2 ISZ CHRST | SET (P+2) EXIT              |
| 0596    | 04433                    | 034135 | CHRS3 ISZ SBPTR | MOVE TO NEXT BUFFER WORD    |
| 0597    | 04434                    | 060345 | LDA .32         | RESTORE BLANK AS            |
| 0598    | 04435                    | 070476 | STA BLANK       | DELETE CHARACTER            |
| 0599    | 04436                    | 126410 | JMP CHRST,I     |                             |

0601\*\*

0602\*\*\* DELETE STATEMENT \*\*

0603\*\*

|      |       |        |       |     |         |                                  |
|------|-------|--------|-------|-----|---------|----------------------------------|
| 0604 | 04437 | 160134 | DLSTM | LDA | SBUFA,I | LOAD SEQUENCE NUMBER             |
| 0605 | 04440 | 016513 |       | JSB | FNDPS   | FIND STATEMENT TO BE DELETED     |
| 0606 | 04441 | 124204 |       | JMP | PEXMA,I | DOESN'T                          |
| 0607 | 04442 | 124204 |       | JMP | PEXMA,I | EXIST                            |
| 0608 | 04443 | 002400 |       | CLA |         | ZERO WORD SKIP FOR DESTINATION   |
| 0609 | 04444 | 006004 |       | INB |         | ADDRESS OF SOURCE WORD SKIP IN B |
| 0610 | 04445 | 016537 |       | JSB | CLPRG   | CLOSE UP PROGRAM                 |
| 0611 | 04446 | 124204 |       | JMP | PEXMA,I | EXIT TO PHASE 1 WAIT             |

0612\*

0613\*\*\*

\*\*\*

0614\*\* ACCEPT STATEMENT \*\*

0615\*\*\*

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0616\*

|      |       |        |       |         |         |                                |
|------|-------|--------|-------|---------|---------|--------------------------------|
| 0617 | 04447 | 060134 | ACTST | LDA     | SBUFA   | COMPUTE                        |
| 0618 | 04450 | 003004 |       | CMA,INA |         | LENGTH                         |
| 0619 | 04451 | 040135 |       | ADA     | SBPTR   | OF STATEMENT                   |
| 0620 | 04452 | 170160 |       | STA     | TEMP,I  | AND RECORD IT                  |
| 0621 | 04453 | 160134 |       | LDA     | SBUFA,I | LOAD SEQUENCE NUMBER           |
| 0622 | 04454 | 016513 |       | JSB     | FNDPS   | SEARCH ON SEQUENCE NUMBER      |
| 0623 | 04455 | 026472 |       | JMP     | ACCS1   | APPEND STATEMENT TO PROGRAM    |
| 0624 | 04456 | 026507 |       | JMP     | ACCS4   | INSERT STATEMENT IN PROGRAM    |
| 0625 | 04457 | 006004 |       | INB     |         | REPLACE STATEMENT IN PROGRAM   |
| 0626 | 04460 | 160001 |       | LDA     | 1,I     | COMPARE LENGTHS OF             |
| 0627 | 04461 | 003004 |       | CMA,INA |         | STATEMENT BEING REPLACED       |
| 0628 | 04462 | 140160 |       | ADA     | TEMP,I  | AND STATEMENT                  |
| 0629 | 04463 | 002003 |       | SZA,RSS |         | REPLACING IT                   |
| 0630 | 04464 | 026474 |       | JMP     | ACCS2   | EQUAL                          |
| 0631 | 04465 | 002021 |       | SSA,RSS |         |                                |
| 0632 | 04466 | 026510 |       | JMP     | ACCS4+1 | SHORTER                        |
| 0633 | 04467 | 160160 |       | LDA     | TEMP,I  | LONGER,                        |
| 0634 | 04470 | 016537 |       | JSB     | CLPRG   | CLOSE UP PROGRAM               |
| 0635 | 04471 | 026474 |       | JMP     | ACCS2   |                                |
| 0636 | 04472 | 160160 | ACCS1 | LDA     | TEMP,I  | LOAD PROGRAM SPACE REQUIREMENT |
| 0637 | 04473 | 016556 |       | JSB     | OVCHK   | SUFFICIENT PROGRAM SPACE LEFT? |
| 0638 | 04474 | 006400 | ACCS2 | CLB     |         | YES, SET COUNTER TO ZERO       |
| 0639 | 04475 | 060134 |       | LDA     | SBUFA   | INITIALIZE                     |
| 0640 | 04476 | 070162 |       | STA     | TEMP2   | SOURCE ADDRESS                 |
| 0641 | 04477 | 160162 | ACCS3 | LDA     | TEMP2,I | TRANSFER WORD FROM             |
| 0642 | 04500 | 170163 |       | STA     | TEMP3,I | S-BUFFER TO PROGRAM SPACE      |
| 0643 | 04501 | 034162 |       | ISZ     | TEMP2   | INCREMENT SOURCE AND           |
| 0644 | 04502 | 034163 |       | ISZ     | TEMP3   | DESTINATION ADDRESSES          |
| 0645 | 04503 | 006004 |       | INB     |         | BUMP COUNTER                   |
| 0646 | 04504 | 154160 |       | CPB     | TEMP,I  | ENTIRE STATEMENT MOVED?        |
| 0647 | 04505 | 124204 |       | JMP     | PEXMA,I | YES                            |
| 0648 | 04506 | 026477 |       | JMP     | ACCS3   | NO                             |
| 0649 | 04507 | 160160 | ACCS4 | LDA     | TEMP,I  | LOAD PROGRAM SPACE REQUIREMENT |
| 0650 | 04510 | 016556 |       | JSB     | OVCHK   | SUFFICIENT PROGRAM SPACE LEFT? |
| 0651 | 04511 | 014554 |       | JSB     | MYTOH   | MAKE                           |
| 0652 | 04512 | 026474 |       | JMP     | ACCS2   | ROOM                           |

0654\*\*

0655\*\*\* FIND SEQUENTIAL POSITION \*\*

0656\*\*

|      |       |        |       |             |                           |
|------|-------|--------|-------|-------------|---------------------------|
| 0657 | 04513 | 000000 | FNIPS | NOP         |                           |
| 0658 | 04514 | 070163 |       | STA TEMP3   | SAVE SEQUENCE NUMBER      |
| 0659 | 04515 | 064112 |       | LDB PBUFF   | STARTING ADDRESS          |
| 0660 | 04516 | 054113 | FNIP1 | CPB PBPTR   | END OF PROGRAM?           |
| 0661 | 04517 | 026535 |       | JMP FNDP4   | YES, EXIT VIA (P+1)       |
| 0662 | 04520 | 160001 |       | LDA 1,1     | SUBTRACT PROGRAM          |
| 0663 | 04521 | 003004 |       | CMA,INA     | SEQUENCE NUMBER FROM      |
| 0664 | 04522 | 040163 |       | ADA TEMP3   | S-BUFFER SEQUENCE NUMBER  |
| 0665 | 04523 | 002003 |       | SZA,RSS     | EQUAL?                    |
| 0666 | 04524 | 026533 |       | JMP FNDP2   | YES, SET EXIT TO (P+3)    |
| 0667 | 04525 | 002020 |       | SSA         | NO, P-SEQ NO > S-SEQ NO ? |
| 0668 | 04526 | 026534 |       | JMP FNDP3   | YES, SET EXIT TO (P+2)    |
| 0669 | 04527 | 060001 |       | LDA 1       | POINT (A) TO              |
| 0670 | 04530 | 002004 |       | INA         | PROGRAM ADDRESS INCREMENT |
| 0671 | 04531 | 144000 |       | ADB 0,1     | COMPUTE NEW ADDRESS       |
| 0672 | 04532 | 026516 |       | JMP FNDP1   |                           |
| 0673 | 04533 | 036513 | FNIP2 | ISZ FNDFS   |                           |
| 0674 | 04534 | 036513 | FNIP3 | ISZ FNDFS   |                           |
| 0675 | 04535 | 074163 | FNIP4 | STB TEMP3   | SAVE STATEMENT ADDRESS    |
| 0676 | 04536 | 126513 |       | JMP FNDFS,1 |                           |

0677\*\*

0678\*\*\* DELETE SPACE IN PROGRAM \*\*

0679\*\*

|      |       |        |       |             |                                |
|------|-------|--------|-------|-------------|--------------------------------|
| 0680 | 04537 | 000000 | CLPRG | NOP         | REFERENCE LOCATION IN TEMP3    |
| 0681 | 04540 | 040163 |       | ADA TEMP3   | SKIP (A) LOCATIONS FROM TEMP3  |
| 0682 | 04541 | 070164 |       | STA TEMP4   | AND SAVE DESTINATION ADDRESS   |
| 0683 | 04542 | 164001 |       | LDB 1,1     | SKIP TO END OF STATEMENT BEING |
| 0684 | 04543 | 044163 |       | ADB TEMP3   | DELETED, SOURCE ADDRESS IN (B) |
| 0685 | 04544 | 054113 | CLPR1 | CPB PBPTR   | ALL OF PROGRAM MOVED?          |
| 0686 | 04545 | 026553 |       | JMP CLPR2   | YES                            |
| 0687 | 04546 | 160001 |       | LDA 1,1     | NO, MOVE WORD FROM SOURCE TO   |
| 0688 | 04547 | 170164 |       | STA TEMP4,1 | DESTINATION ADDRESS            |
| 0689 | 04550 | 034164 |       | ISZ TEMP4   | INCREMENT DESTINATION ADDRESS  |
| 0690 | 04551 | 006004 |       | INB         | INCREMENT SOURCE ADDRESS       |
| 0691 | 04552 | 026544 |       | JMP CLPR1   |                                |
| 0692 | 04553 | 060164 | CLPR2 | LDA TEMP4   | SET END-OF-PROGRAM             |
| 0693 | 04554 | 070113 |       | STA PBPTR   | POINTER                        |
| 0694 | 04555 | 126537 |       | JMP CLPRG,1 |                                |

0695\*\*

0696\*\*\* CHECK FOR PROGRAM SPACE OVERFLOW \*\*

0697\*\*

|      |       |        |       |             |                             |
|------|-------|--------|-------|-------------|-----------------------------|
| 0698 | 04556 | 000000 | OVCHK | NOP         | NEW WORD REQUIREMENT IN (A) |
| 0699 | 04557 | 064113 |       | LDB PBPTR   | SET SOURCE ADDRESS          |
| 0700 | 04560 | 074162 |       | STB TEMP2   | FOR PROGRAM RELOCATION      |
| 0701 | 04561 | 044000 |       | ADB 0       | SET DESTINATION             |
| 0702 | 04562 | 074164 |       | STB TEMP4   | ADDRESS                     |
| 0703 | 04563 | 007004 |       | CMB,INB     | ENOUGH                      |
| 0704 | 04564 | 044106 |       | ADB LWBM    | FREE                        |
| 0705 | 04565 | 006020 |       | SSB         | SPACE?                      |
| 0706 | 04566 | 124271 |       | JMP FSCEF,1 | NO, PROGRAM SPACE OVERFLOW  |
| 0707 | 04567 | 064164 |       | LDB TEMP4   | YES, RELOCATE FREE          |
| 0708 | 04570 | 074113 |       | STB PBPTR   | PROGRAM SPACE POINTER       |
| 0709 | 04571 | 126556 |       | JMP OVCHK,1 |                             |

**LIST PROGRAM**  
**PRE-EXECUTION PROCESSING**



```

0002*
0003* *****
0004***          ***
0005**  LIST THE PROGRAM  ***
0006***          ***
0007* *****
0008*
0009 04572 064112 LIST LDB PBUFF INITIALIZE TO FIRST
0010 04573 074157 STB TEMPS STATEMENT OF PROGRAM
0011 04574 015614 JSB GETCR SEQUENCE NUMBER GIVEN?
0012 04575 026607 JMP LIST0 NO
0013 04576 064131 LDB .BUFA YES, SET FOR
0014 04577 074135 STB SBPTR SEQUENCE NUMBER
0015 04600 114216 JSB INCHK,I FETCH
0016 04601 000463 DEF MAXSN IT
0017 04602 160131 LDA .BUFA,I LOAD SEQUENCE NUMBER
0018 04603 016513 JSB FNDRS FIND INITIAL STATEMENT
0019 04604 124205 JMP RDYDA,I
0020 04605 000000 NOP SAVE
0021 04606 074157 STB TEMPS ADDRESS
0022 04607 006400 LIST0 CLB HIGH-SPEED
0023 04610 054136 CPB TFLAG PUNCH?
0024 04611 026614 JMP LIST1 NO
0025 04612 060373 LDA B133 YES, EMIT
0026 04613 114127 JSB LISTR,I LEADER
0027 04614 064157 LIST1 LDB TEMPS MORE
0028 04615 054113 CPB PBPTR PROGRAM?
0029 04616 027003 JMP LIS13 NO
0030 04617 003400 CCA INITIALIZE
0031 04620 040134 ADA SBUFA OUTPUT BUFFER
0032 04621 070132 STA BADDR POINTER
0033 04622 002400 CLA INITIALIZE
0034 04623 070133 STA CCNT CHARACTER COUNT
0035 04624 160157 LDA TEMPS,I OUTPUT
0036 04625 017015 JSB OUTIN SEQUENCE NUMBER
0037 04626 060476 LDA BLANK OUTPUT
0038 04627 015715 JSB OUTCR BLANK
0039 04630 034157 ISZ TEMPS FETCH
0040 04631 160157 LDA TEMPS,I STATEMENT LENGTH
0041 04632 003004 CMA,INA SET
0042 04633 002004 INA WORD
0043 04634 071467 STA SLWST COUNTER
0044 04635 034157 LIST3 ISZ TEMPS MORE
0045 04636 035467 ISZ SLWST STATEMENT?
0046 04637 026644 JMP LIST4 YES
0047 04640 064134 LIST2 LDB SBUFA OUTPUT
0048 04641 060133 LDA CCNT STATEMENT
0049 04642 114127 JSB LISTR,I
0050 04643 026614 JMP LIST1
0051 04644 160157 LIST4 LDA TEMPS,I
0052 04645 010420 AND OPMSK
0053 04646 002003 SZA,RSS NULL OPERATOR?
0054 04647 026670 JMP LIST5 YES
0055 04650 070162 STA TEMP2 NO, SAVE OPERATOR
0056 04651 001727 ALF,ALF SINGLE
0057 04652 001100 ARS

```

|      |       |        |                   |                           |
|------|-------|--------|-------------------|---------------------------|
| 0058 | 04653 | 064000 | LDB 0             | CHARACTER                 |
| 0059 | 04654 | 040446 | ADA M21           |                           |
| 0060 | 04655 | 002021 | SSA,RSS           | OPERATOR?                 |
| 0061 | 04656 | 026772 | JMP LIS12         | NO                        |
| 0062 | 04657 | 005000 | BLS               | YES                       |
| 0063 | 04660 | 006004 | INB               | LOAD                      |
| 0064 | 04661 | 044301 | ADB FOPBS         | SYMBOL'S                  |
| 0065 | 04662 | 160001 | LDA 1,I           | ASCII WORD                |
| 0066 | 04663 | 001727 | ALF,ALF           | ADJUST                    |
| 0067 | 04664 | 010376 | AND MSK0          | CHARACTER                 |
| 0068 | 04665 | 050347 | CPA .34           | " ?                       |
| 0069 | 04666 | 027011 | JMP LIS14         | YES                       |
| 0070 | 04667 | 015715 | JSB OUTCR         | NO                        |
| 0071 | 04670 | 160157 | LIST5 LDA TEMPS,I |                           |
| 0072 | 04671 | 010425 | AND OPDMK         | SAVE                      |
| 0073 | 04672 | 070163 | STA TEMP3         | OPERAND                   |
| 0074 | 04673 | 010423 | AND TYPFL         | EXTRACT OPERAND TYPE      |
| 0075 | 04674 | 072333 | STA LFLAG         | SET LFLAG FALSE           |
| 0076 | 04675 | 002020 | SSA               | FLAG BIT SET?             |
| 0077 | 04676 | 026732 | JMP LIST9         | YES                       |
| 0078 | 04677 | 002003 | SZA,RSS           | NO, NULL OPERAND?         |
| 0079 | 04700 | 026635 | JMP LIST3         | YES                       |
| 0080 | 04701 | 050336 | CPA .15           | FUNCTION?                 |
| 0081 | 04702 | 026725 | JMP LIST8         | YES                       |
| 0082 | 04703 | 040435 | LIST6 ADA M5      |                           |
| 0083 | 04704 | 002020 | SSA               | LETTER-DIGIT COMBINATION? |
| 0084 | 04705 | 026710 | JMP LIST7         | NO                        |
| 0085 | 04706 | 003400 | CCA               | YES, SET                  |
| 0086 | 04707 | 072333 | STA LFLAG         | LFLAG FALSE               |
| 0087 | 04710 | 060163 | LIST7 LDA TEMP3   |                           |
| 0088 | 04711 | 001727 | ALF,ALF           | RESTORE AND               |
| 0089 | 04712 | 001700 | ALF               |                           |
| 0090 | 04713 | 010374 | AND B177          | OUTPUT                    |
| 0091 | 04714 | 040363 | ADA B100          |                           |
| 0092 | 04715 | 015715 | JSB OUTCR         | LETTER                    |
| 0093 | 04716 | 036333 | ISZ LFLAG         | DIGIT FOLLOWS?            |
| 0094 | 04717 | 026635 | JMP LIST3         | NO                        |
| 0095 | 04720 | 060163 | LDA TEMP3         | YES                       |
| 0096 | 04721 | 010336 | AND .15           | RESTORE                   |
| 0097 | 04722 | 040353 | ADA .43           | DIGIT                     |
| 0098 | 04723 | 015715 | JSB OUTCR         | OUTPUT DIGIT              |
| 0099 | 04724 | 026635 | JMP LIST3         |                           |
| 0100 | 04725 | 060365 | LIST8 LDA F       | OUTPUT                    |
| 0101 | 04726 | 015715 | JSB OUTCR         | 'F'                       |
| 0102 | 04727 | 060371 | LDA N             | OUTPUT                    |
| 0103 | 04730 | 015715 | JSB OUTCR         | 'N'                       |
| 0104 | 04731 | 026710 | JMP LIST7         |                           |
| 0105 | 04732 | 020470 | LIST9 XOR FLGBT   |                           |
| 0106 | 04733 | 002102 | CLE,SZA           | NUMBER?                   |
| 0107 | 04734 | 026751 | JMP LIS10         | NO                        |
| 0108 | 04735 | 034157 | ISZ TEMPS         | YES                       |
| 0109 | 04736 | 070153 | STA SIGN          | SET SIGN FLAG FALSE       |
| 0110 | 04737 | 160157 | LDA TEMPS,I       |                           |
| 0111 | 04740 | 034157 | ISZ TEMPS         |                           |
| 0112 | 04741 | 164157 | LDB TEMPS,I       |                           |
| 0113 | 04742 | 035467 | ISZ SLWST         |                           |

|        |                   |        |                   |                         |
|--------|-------------------|--------|-------------------|-------------------------|
| 0114   | 04743             | 035467 | ISZ SLWST         |                         |
| 0115   | 04744             | 002020 | SSA               | NEGATIVE NUMBER?        |
| 0116   | 04745             | 002300 | CCE               | YES, SET SIGN FLAG TRUE |
| 0117   | 04746             | 114220 | JSB NUMOA,I       |                         |
| 0118   | 04747             | 000000 | NOP               |                         |
| 0119   | 04750             | 026635 | JMP LIST3         |                         |
| 0120   | 04751             | 050326 | LIS10 CPA .3      | INTEGER?                |
| 0121   | 04752             | 026765 | JMP LIS11         | YES                     |
| 0122   | 04753             | 050336 | CPA .15           | NO, FUNCTION?           |
| 0123   | 04754             | 002001 | RSS               | YES                     |
| 0124   | 04755             | 026703 | JMP LIST6         | NO, MUST BE A PARAMETER |
| 0125   | 04756             | 060163 | LDA TEMP3         | COMPUTE                 |
| 0126   | 04757             | 001722 | ALF,RAL           | PRINT                   |
| 0127   | 04760             | 010420 | AND OPMSK         | TABLE                   |
| 0128   | 04761             | 070162 | STA TEMP2         | CODE                    |
| 0129   | 04762             | 064322 | LDB ATAB          | OUTPUT                  |
| 0130   | 04763             | 017077 | JSB MCOU          | FUNCTION NAME           |
| 0131   | 04764             | 026635 | JMP LIST3         |                         |
| 0132   | 04765             | 034157 | LIS11 ISZ TEMPS   | OUTPUT                  |
| 0133   | 04766             | 035467 | ISZ SLWST         |                         |
| 0134   | 04767             | 160157 | LDA TEMPS,I       | INTEGER                 |
| 0135   | 04770             | 017015 | JSB OUTIN         |                         |
| 0136   | 04771             | 026635 | JMP LIST3         | OPERAND                 |
| 0137   | 04772             | 060476 | LIS12 LDA BLANK   | OUTPUT                  |
| 0138   | 04773             | 015715 | JSB OUTCR         | BLANK                   |
| 0139   | 04774             | 064307 | LDB STTYP         | OUTPUT                  |
| 0140   | 04775             | 017077 | JSB MCOU          | OPERATOR                |
| 0141   | 04776             | 060415 | LDA REMOP         | WAS IT                  |
| 0142   | 04777             | 050162 | CPA TEMP2         | A REM?                  |
| 0143   | 05000             | 027056 | JMP OUTS1         | YES, OUTPUT REMARK      |
| 0144   | 05001             | 060476 | LDA BLANK         | NO, OUTPUT              |
| 0145   | 05002             | 026667 | JMP LIST5-1       | A BLANK                 |
| 0146   | 05003             | 006400 | LIS13 CLB         | HIGH-SPEED              |
| 0147   | 05004             | 054136 | CPB TFLAG         | PUNCH?                  |
| 0148   | 05005             | 124205 | JMP RDYDA,I       | NO                      |
| 0149   | 05006             | 060373 | LDA B133          | YES, EMIT               |
| 0150   | 05007             | 114127 | JSB LISTR,I       | TRAILER                 |
| 0151   | 05010             | 124205 | JMP RDYDA,I       |                         |
| 0152   | 05011             | 015715 | LIS14 JSB OUTCR   | OUTPUT "                |
| 0153   | 05012             | 017055 | JSB OUTST         | OUTPUT QUOTE STRING     |
| 0154   | 05013             | 060347 | LDA .34           | OUTPUT                  |
| 0155   | 05014             | 026667 | JMP LIST5-1       |                         |
| 0156*  |                   |        | *                 |                         |
| 0157** | OUTPUT AN INTEGER | **     |                   |                         |
| 0158*  |                   |        | *                 |                         |
| 0159   | 05015             | 000000 | OUTIN NOP         | INTEGER IN (A)          |
| 0160   | 05016             | 064434 | LDB M4            | SET                     |
| 0161   | 05017             | 077522 | STB DI0CT         | DIGIT COUNTER           |
| 0162   | 05020             | 067132 | LDB LDVSR         | SET DIVISOR             |
| 0163   | 05021             | 076351 | STB DIVSR         | ADDRESS                 |
| 0164   | 05022             | 006400 | CLB               | SET LEADING             |
| 0165   | 05023             | 076556 | STB LDZRO         | ZERO FLAG               |
| 0166   | 05024             | 166351 | OUT11 LDB DIVSR,I | NEGATE                  |
| 0167   | 05025             | 007004 | CMB,INB           | AND STORE               |
| 0168   | 05026             | 076513 | STB MIND          | DIVISOR                 |
| 0169   | 05027             | 007400 | CCB               | SET QUOTIENT            |

|        |                              |        |                   |                               |
|--------|------------------------------|--------|-------------------|-------------------------------|
| 0170   | 05030                        | 006004 | INB               | TO ZERO                       |
| 0171   | 05031                        | 042513 | ADA MIND          | SUBTRACT DIVISOR FROM INTEGER |
| 0172   | 05032                        | 002021 | SSA,RSS           | NEGATIVE RESULT?              |
| 0173   | 05033                        | 027030 | JMP *-3           | NO, INCREMENT QUOTIENT        |
| 0174   | 05034                        | 142351 | ADA DIVSK,I       | YES, RECOVER REMAINDER        |
| 0175   | 05035                        | 073077 | STA MCOUT         | AND SAVE IT                   |
| 0176   | 05036                        | 060001 | LDA 1             |                               |
| 0177   | 05037                        | 002002 | SZA               | ZERO?                         |
| 0178   | 05040                        | 027043 | JMP OUTI2         | NO                            |
| 0179   | 05041                        | 052556 | CPA LDZRO         | YES, LEADING ZERO?            |
| 0180   | 05042                        | 027046 | JMP OUTI3         | YES                           |
| 0181   | 05043                        | 040357 | OUTI2 ADA .48     | NO, COMPUTE ASCII FOR DIGIT   |
| 0182   | 05044                        | 072556 | STA LDZRO         | SET 'ZEROES SIGNIFICANT'      |
| 0183   | 05045                        | 015715 | JSB OUTCR         | OUTPUT DIGIT                  |
| 0184   | 05046                        | 063077 | OUTI3 LDA MCOUT   | RETRIEVE REMAINDER            |
| 0185   | 05047                        | 036351 | ISZ DIVSK         | SET FOR NEXT DIVISOR          |
| 0186   | 05050                        | 037522 | ISZ DIGCT         | DIVISION NECESSARY?           |
| 0187   | 05051                        | 027024 | JMP OUTI1         | YES                           |
| 0188   | 05052                        | 040357 | ADA .48           | NO, COMPUTE ASCII FOR LAST    |
| 0189   | 05053                        | 015715 | JSB OUTCR         | DIGIT AND OUTPUT IT           |
| 0190   | 05054                        | 127015 | JMP OUTIN,I       |                               |
| 0191*  |                              |        | *                 |                               |
| 0192** | OUTPUT A STRING              | **     |                   |                               |
| 0193*  |                              |        | *                 |                               |
| 0194   | 05055                        | 000000 | OUTST NOP         | * ENTRY POINT                 |
| 0195   | 05056                        | 160157 | OUTS1 LDA TEMPS,I | REM ENTRY POINT               |
| 0196   | 05057                        | 010374 | AND B177          | OUTPUT SECOND CHARACTER       |
| 0197   | 05060                        | 002002 | SZA               | OF WORD IF                    |
| 0198   | 05061                        | 015715 | JSB OUTCR         | NOT NULL                      |
| 0199   | 05062                        | 034157 | ISZ TEMPS         | BUMP POINTER                  |
| 0200   | 05063                        | 035467 | ISZ SLWST         | REM COMPLETED?                |
| 0201   | 05064                        | 002001 | RSS               | NO                            |
| 0202   | 05065                        | 026640 | JMP LIST2         | YES                           |
| 0203   | 05066                        | 160157 | LDA TEMPS,I       | EXTRACT                       |
| 0204   | 05067                        | 001727 | ALF,ALF           | FIRST CHARACTER               |
| 0205   | 05070                        | 010374 | AND B177          | OF WORD                       |
| 0206   | 05071                        | 050325 | CPA .2            | EXIT                          |
| 0207   | 05072                        | 127055 | JMP OUTST,I       | IF A                          |
| 0208   | 05073                        | 050326 | CPA .3            | CLOSING                       |
| 0209   | 05074                        | 127055 | JMP OUTST,I       | QUOTE                         |
| 0210   | 05075                        | 015715 | JSB OUTCR         | OUTPUT                        |
| 0211   | 05076                        | 027056 | JMP OUTS1         | CHARACTER                     |
| 0212*  |                              |        | *                 |                               |
| 0213** | LIST A MULTICHARACTER SYMBOL | **     |                   |                               |
| 0214*  |                              |        | *                 |                               |
| 0215   | 05077                        | 000000 | MCCUT NOP         |                               |
| 0216   | 05100                        | 160001 | MCCU1 LDA 1,I     | LOAD INFORMATION WORD         |
| 0217   | 05101                        | 010420 | AND OPMSK         | COMPARE WITH                  |
| 0218   | 05102                        | 050162 | CPA TEMP2         | OPERATOR CODE                 |
| 0219   | 05103                        | 027112 | JMP MCOU2         | EQUAL                         |
| 0220   | 05104                        | 160001 | LDA 1,I           | UNEQUAL,                      |
| 0221   | 05105                        | 010331 | AND .7            | COMPUTE                       |
| 0222   | 05106                        | 040326 | ADA .3            | ENTRY                         |
| 0223   | 05107                        | 001100 | ARS               | LENGTH                        |
| 0224   | 05110                        | 044000 | ADB 0             | COMPUTE ADDRESS OF NEXT ENTRY |
| 0225   | 05111                        | 027100 | JMP MCOU1         |                               |

|       |        |        |        |             |                             |
|-------|--------|--------|--------|-------------|-----------------------------|
| 0226  | 05112  | 160001 | MCCU2  | LDA 1,I     | COMPUTE                     |
| 0227  | 05113  | 010331 |        | AND .7      | ENTRY                       |
| 0228  | 05114  | 003004 |        | CMA,INA     | LENGTH                      |
| 0229  | 05115  | 073522 |        | STA DIGCT   | AND SAVE IT                 |
| 0230  | 05116  | 006104 |        | CLE,INB     | SET FOR FIRST CHARACTER     |
| 0231  | 05117  | 074163 |        | STB TEMP3   | SAVE SYMBOL ADDRESS         |
| 0232  | 05120  | 160163 | MCCU3  | LDA TEMP3,I | LOAD WORD                   |
| 0233  | 05121  | 002041 |        | SEZ,RSS     | FIRST CHARACTER?            |
| 0234  | 05122  | 001727 |        | ALF,ALF     | YES, POSITION IT            |
| 0235  | 05123  | 010374 |        | AND B177    | EXTRACT CHARACTER           |
| 0236  | 05124  | 015715 |        | JSB OUTCR   | OUTPUT IT                   |
| 0237  | 05125  | 002240 |        | SEZ,CME     | SET FOR NEXT CHARACTER      |
| 0238  | 05126  | 034163 |        | ISZ TEMP3   | MOVE TO NEXT WORD OF SYMBOL |
| 0239  | 05127  | 037522 |        | ISZ DIGCT   | MORE CHARACTERS?            |
| 0240  | 05130  | 027120 |        | JMP MCOU3   | YES                         |
| 0241  | 05131  | 127077 |        | JMP MCOU3,I |                             |
| 0242* |        |        |        |             |                             |
| 0243* |        |        |        |             |                             |
| 0244  | 05132  | 005133 | LDVSR  | DEF **1     |                             |
| 0245  | 05133  | 023420 |        | DEC 10000   |                             |
| 0246  | 05134  | 001750 |        | DEC 1000    |                             |
| 0247  | 05135  | 000144 |        | DEC 100     |                             |
| 0248  | 05136  | 000012 |        | DEC 10      |                             |
| 0249* |        |        |        |             |                             |
| 0250* |        |        |        |             |                             |
| 0251  | 043530 |        | SFLAG  | EQU ARrys   |                             |
| 0252  | 04333  |        | TABLE  | EQU PRGIN   |                             |
| 0253  | 00167  |        | LNGLTH | EQU TEMPS+8 |                             |
| 0254  | 04351  |        | SMEND  | EQU INTCK   |                             |
| 0255  | 04556  |        | SLENG  | EQU OVCHK   |                             |
| 0256  | 04513  |        | TBLPT  | EQU FNDPS   |                             |
| 0257  | 04537  |        | TSFTR  | EQU CLPRG   |                             |
| 0258  | 04556  |        | INTGR  | EQU OVCHK   |                             |
| 0259  | 04333  |        | LFLAG  | EQU PRGIN   |                             |
| 0260  | 04351  |        | DIVSR  | EQU INTCK   |                             |
| 0261  | 04556  |        | LDZRO  | EQU OVCHK   |                             |
| 0262  | 04513  |        | MIND   | EQU FNDPS   |                             |

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0264*          *****
0265*          PHASE 2 OF THE COMPILER
0266*          *****
0267*
0268*          THIS PHASE HAS THE FOLLOWING 3 FUNCTIONS:
0269*          1. SYMBOL TABLE CONSTRUCTION
0270*          2. FOR LOOP CHECKING
0271*          3. ARRAY STORAGE ALLOCATION
0272*
0273  05137 060113 MFASE LDA PBPTR      NULL
0274  05140 050112      CPA PBUFF      PROGRAM?
0275  05141 124205      JMP RDYDA,I    YES
0276  05142 070115      STA FCORE      NO, SET FOR-TABLE POINTER
0277  05143 060110      LDA FWAM
0278  05144 070170      STA COML      INITIALIZE COMMON POINTER
0279  05145 060117      LDA SYMTA
0280  05146 070116      STA SYMTF      INITIALIZE SYMBOL TABLE POINTER
0281  05147 060112      LDA PBUFF
0282  05150 070135      STA MPTR      INITIALIZE PROGRAM POINTER
0283  05151 164135 MLC11 LDB MPTR,I
0284  05152 074145      STB .LNUM      SET LINE NUMBER
0285  05153 064135      LDB MPTR
0286  05154 034135      ISZ MPTR
0287  05155 144135      ADB MPTR,I    COMPUTE LOCATION OF NEXT
0288  05156 075515      STB MNPTR      STATEMENT AND STORE THIS
0289  05157 034135      ISZ MPTR
0290  05160 160135      LDA MPTR,I    FETCH THE FIRST WORD IN THE
0291  05161 001100 MLC10 ARS          STATEMENT AND SAVE
0292  05162 001727      ALF,ALF        THE STATEMENT TYPE
0293  05163 010362      AND .63
0294  05164 070146      STA TYPE
0295  05165 050355      CPA .46        MAT STATEMENT?
0296  05166 027176      JMP MLC12      YES
0297  05167 050343      CPA .30        NO, REM STATEMENT?
0298  05170 074135      STB MPTR      YES, SET TO SKIP IT
0299  05171 050353      CPA .43        NO, PRINT STATEMENT?
0300  05172 074135      STB MPTR      YES, SET TO SKIP IT
0301  05173 003400      CCA          NO, SET
0302  05174 070171      STA MWDNU      'FIRST VARIABLE'
0303  05175 027212      JMP MLOP2+1    FLAG
0304*
0305  05176 060135 MLC12 LDA MPTR      SEEK
0306  05177 002004      INA          SUBSIDIARY
0307  05200 160000      LDA 0,I      STATEMENT
0308  05201 027161      JMP MLC10     TYPE
0309*
0310  05202 010401 MLC13 AND MSK1     YES, ISOLATE OPERAND
0311  05203 064135      LDB MPTR      INDEX THE PROGRAM POINTER BY
0312  05204 002003      SZA,RSS       AN AMOUNT APPROPRIATE TO THE
0313  05205 044325      ADB .2        OPERAND. THE FOLLOWING APPLIES
0314  05206 050326      CPA .3        OPERAND = 0  ADD 2 TO POINTER
0315  05207 006004      INB          OPERAND =3  ADD 1 TO POINTER
0316  05210 074135      STB MPTR
0317*
0318  05211 034135 MLC12 ISZ MPTR      INCREMENT WORD-OF-STATEMENT PTR
0319  05212 060135      LDA MPTR      STATEMENT

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|       |       |        |                  |                         |
|-------|-------|--------|------------------|-------------------------|
| 0320  | 05213 | 051515 | CPA MNPTR        | EXHAUSTED?              |
| 0321  | 05214 | 027272 | JMP MLOP5        | YES                     |
| 0322  | 05215 | 160135 | LDA MPTR,1       | NO                      |
| 0323  | 05216 | 002020 | SSA              | 'CONSTANT' OPERAND?     |
| 0324  | 05217 | 027202 | JMP MLO13        | YES                     |
| 0325  | 05220 | 010401 | AND MSK1         | NO                      |
| 0326  | 05221 | 002003 | SZA,RSS          | NULL OPERAND?           |
| 0327  | 05222 | 027211 | JMP MLOP2        | YES                     |
| 0328  | 05223 | 070157 | STA MBOX1        | NO, SAVE IT             |
| 0329  | 05224 | 010336 | AND .15          | PROGRAMMER-DEFINED      |
| 0330  | 05225 | 050336 | CPA .15          | FUNCTION?               |
| 0331  | 05226 | 027301 | JMP MLOP6        | YES                     |
| 0332  | 05227 | 040434 | ADA M4           | NO                      |
| 0333  | 05230 | 002020 | SSA              | ARRAY VARIABLE?         |
| 0334  | 05231 | 027320 | JMP MLOP7        | YES                     |
| 0335  | 05232 | 060157 | LDA MBOX1        | NO, SIMPLE VARIABLE     |
| 0336  | 05233 | 114231 | JSB SSYMA,1      | ALREADY IN              |
| 0337  | 05234 | 006021 | SSB,RSS          | SYMBOL TABLE?           |
| 0338  | 05235 | 027244 | JMP MLOP3        | YES                     |
| 0339  | 05236 | 060470 | LDA MNEG         | NO                      |
| 0340  | 05237 | 064471 | LDB MNEG+1       | ENTER                   |
| 0341  | 05240 | 070160 | STA MBOX1+1      | IT WITH                 |
| 0342  | 05241 | 074161 | STB MBOX1+2      | 'UNDEFINED'             |
| 0343  | 05242 | 060433 | LDA M3           | VALUE                   |
| 0344  | 05243 | 017501 | JSB ESYMT        |                         |
| 0345  | 05244 | 064146 | MLCP3 LDB TYPE   |                         |
| 0346  | 05245 | 060157 | LDA MBOX1        |                         |
| 0347  | 05246 | 054347 | CPB .34          | NEXT STATEMENT?         |
| 0348  | 05247 | 027261 | JMP MLOP4        | YES                     |
| 0349  | 05250 | 054346 | CPB .33          | NO, FOR STATEMENT?      |
| 0350  | 05251 | 034171 | ISZ MWDNO        | YES, FIRST VARIABLE?    |
| 0351  | 05252 | 027211 | JMP MLOP2        | NO                      |
| 0352  | 05253 | 034115 | ISZ FCORE        | DEMAND                  |
| 0353  | 05254 | 064115 | LDB FCORE        | SPACE                   |
| 0354  | 05255 | 054116 | CPB SYMTF        | FOR NEW                 |
| 0355  | 05256 | 027511 | JMP MER8-1       | ENTRY                   |
| 0356  | 05257 | 170115 | STA FCORE,1      | SAVE VARIABLE NAME      |
| 0357  | 05260 | 027211 | JMP MLOP2        |                         |
| 0358* |       |        |                  |                         |
| 0359  | 05261 | 064115 | MLCP4 LDB FCORE  | FOR-TABLE               |
| 0360  | 05262 | 054113 | CPB PBPTR        | EMPTY?                  |
| 0361  | 05263 | 014477 | JSB ERROR        | YES                     |
| 0362  | 05264 | 150115 | MER3 CPA FCORE,1 | NO, MATCH LATEST ENTRY? |
| 0363  | 05265 | 002001 | RSS              | YES                     |
| 0364  | 05266 | 027263 | JMP MER3-1       | NO                      |
| 0365  | 05267 | 044431 | ADB M1           | REMOVE                  |
| 0366  | 05270 | 074115 | STB FCORE        | MATCHED                 |
| 0367  | 05271 | 027211 | JMP MLOP2        | ENTRY                   |
| 0368* |       |        |                  |                         |
| 0369  | 05272 | 050113 | MLCP5 CPA PBPTR  | PROGRAM EXHAUSTED?      |
| 0370  | 05273 | 002001 | RSS              | YES                     |
| 0371  | 05274 | 027151 | JMP MLOP1        | NO                      |
| 0372  | 05275 | 060146 | LDA TYPE         | YES                     |
| 0373  | 05276 | 050350 | CPA .37          | END STATEMENT?          |
| 0374  | 05277 | 027407 | JMP M1LOP        | YES                     |
| 0375  | 05300 | 014477 | JSB ERROR        | NO                      |

|       |       |        |       |             |                                  |
|-------|-------|--------|-------|-------------|----------------------------------|
| 0376  | 05301 | 160135 | MLCP6 | LDA MPTR,I  | ISOLATE                          |
| 0377  | 05302 | 010420 |       | AND OPMSK   | PRECEDING OPERATOR               |
| 0378  | 05303 | 050414 |       | CPA DEFOP   | 'DEF' ?                          |
| 0379  | 05304 | 002001 |       | RSS         | YES                              |
| 0380  | 05305 | 027211 |       | JMP MLOP2   | NO GO TO PROCESS NEXT WORD       |
| 0381  | 05306 | 060157 |       | LDA MBOX1   | SEARCH SYMBOL TABLE FOR          |
| 0382  | 05307 | 114231 |       | JSB SSYMA,I | THE FUNCTION                     |
| 0383  | 05310 | 006021 |       | SSB,RSS     |                                  |
| 0384  | 05311 | 014477 |       | JSB ERROR   | FOUND. ERROR MULTIPLY DEFINED    |
| 0385  | 05312 | 060135 | MER4  | LDA MPTR    |                                  |
| 0386  | 05313 | 040326 |       | ADA .3      | ENTER THE FUNCTION INTO THE      |
| 0387  | 05314 | 070160 |       | STA MBOX1+1 | SYMBOL TABLE TOGETHER WITH       |
| 0388  | 05315 | 060432 |       | LDA M2      | ITS ENTRY POINT IN THE SOURCE    |
| 0389  | 05316 | 017501 |       | JSB ESYMT   | CODE                             |
| 0390  | 05317 | 027211 |       | JMP MLOP2   | GO TO PROCESS THE NEXT WORD      |
| 0391* |       |        |       |             |                                  |
| 0392  | 05320 | 070001 | MLCP7 | STA 1       |                                  |
| 0393  | 05321 | 060146 |       | LDA TYPE    |                                  |
| 0394  | 05322 | 050341 |       | CPA .27     | DIM STATEMENT?                   |
| 0395  | 05323 | 027335 |       | JMP MLOP8   | YES                              |
| 0396  | 05324 | 050342 |       | CPA .28     | NO, COM STATEMENT?               |
| 0397  | 05325 | 027335 |       | JMP MLOP8   | YES                              |
| 0398  | 05326 | 017522 |       | JSB MSYMT   | NO, LOOK FOR IT IN SYMBOL TABLE  |
| 0399  | 05327 | 027211 |       | JMP MLOP2   | FOUND                            |
| 0400  | 05330 | 002400 |       | CLA         | NOT THERE                        |
| 0401  | 05331 | 070160 |       | STA MBOX1+1 | ENTER IT WITH                    |
| 0402  | 05332 | 070161 |       | STA MBOX1+2 | DIMENSIONS AND                   |
| 0403  | 05333 | 070162 |       | STA MBOX1+3 | DIMENSIONALITY                   |
| 0404  | 05334 | 027370 |       | JMP MLOP0   | UNDEFINED                        |
| 0405* |       |        |       |             |                                  |
| 0406  | 05335 | 034135 | MLCP8 | ISZ MPTR    | PROCESS COM OR DIM STMT          |
| 0407  | 05336 | 034135 |       | ISZ MPTR    |                                  |
| 0408  | 05337 | 160135 |       | LDA MPTR,I  | PICK UP FIRST DIMENSION          |
| 0409  | 05340 | 001727 |       | ALF,ALF     | SHIFT TO M. S. PART OF WORD      |
| 0410  | 05341 | 054433 |       | CPB M3      | IS THIS A SINGLE DIMENSION ARRAY |
| 0411  | 05342 | 027347 |       | JMP **5     | YES, JUMP                        |
| 0412  | 05343 | 034135 |       | ISZ MPTR    | NO, INDEX POINTER TO THE LOC.    |
| 0413  | 05344 | 034135 |       | ISZ MPTR    | OF SECOND DIMENSION AND PACK     |
| 0414  | 05345 | 130135 |       | IOR MPTR,I  | INTO A WITH THE FIRST DIMENSION  |
| 0415  | 05346 | 002001 |       | RSS         |                                  |
| 0416  | 05347 | 030324 |       | IOR .1      |                                  |
| 0417  | 05350 | 070161 |       | STA MBOX1+2 | SET UP TO STORE PACKED           |
| 0418  | 05351 | 070162 |       | STA MBOX1+3 | DIMENSIONS IN FORMAL AND ACTUAL  |
| 0419  | 05352 | 002400 |       | CLA         | SLOTS AND UNDEFINED FLAG IN      |
| 0420  | 05353 | 070160 |       | STA MBOX1+1 | STORAGE ALLOCATION SLOT          |
| 0421  | 05354 | 017522 |       | JSB MSYMT   | IN SYMBOL TABLE?                 |
| 0422  | 05355 | 027373 |       | JMP MLOP9   | NO                               |
| 0423  | 05356 | 060146 |       | LDA TYPE    | YES                              |
| 0424  | 05357 | 050342 |       | CPA .28     |                                  |
| 0425  | 05360 | 002001 |       | RSS         | IS STMT A COM                    |
| 0426  | 05361 | 027370 |       | JMP MLOP0   | NO, JUMP                         |
| 0427  | 05362 | 060161 |       | LDA MBOX1+2 | YES PICK UP PACKED DIMENSIONS    |
| 0428  | 05363 | 015336 |       | JSB MDIM    | COMPUTE STORAGE REQUIRED         |
| 0429  | 05364 | 064170 |       | LDB COML    | POINTER TO NEXT FREE LOC IN COM  |
| 0430  | 05365 | 074160 |       | STB MBOX1+1 | STORE IN STORAGE ALLOCATION SLOT |
| 0431  | 05366 | 044000 |       | ADB 0       | UPDATE POINTER BY THE AMOUNT OF  |



|       |       |        |       |             |                                  |
|-------|-------|--------|-------|-------------|----------------------------------|
| 0432  | 05367 | 074170 |       | STB COML    | STORAGE ASSIGNED.                |
| 0433  | 05370 | 060434 | MLCP0 | LDA M4      | ENTER THE FOUR WORD ENTRY        |
| 0434  | 05371 | 017501 |       | JSB ESYMT   | PREVIOUSLY SET UP IN MBOX1 INTO  |
| 0435  | 05372 | 027211 |       | JMP MLOP2   | SYMBOL TABLE AND CONTINUE        |
| 0436* |       |        |       |             |                                  |
| 0437  | 05373 | 044325 | MLCP9 | ADB .2      | CHECK THE FORMAL DIMENSIONS      |
| 0438  | 05374 | 160001 |       | LDA 1,I     | LOCATION TO SEE IF THE DIMENSION |
| 0439  | 05375 | 002002 |       | SZA         | IS ALREADY DEFINED               |
| 0440  | 05376 | 014477 |       | JSB ERROR   | ERROR, DOUBLY DIMENSIONED        |
| 0441  | 05377 | 060146 | MER5  | LDA TYPE    |                                  |
| 0442  | 05400 | 050342 |       | CPA .28     | COM STMT?                        |
| 0443  | 05401 | 124270 |       | JMP ESYN3,I | ERROR MISPLACED COM STMT         |
| 0444  | 05402 | 060161 |       | LDA MBOX1+2 |                                  |
| 0445  | 05403 | 170001 |       | STA 1,I     | STORE THESE DIMENSIONS IN FORMAL |
| 0446  | 05404 | 006004 |       | INB         | AND ACTUAL SLOTS IN SYMBOL TABLE |
| 0447  | 05405 | 170001 |       | STA 1,I     | ENTRY                            |
| 0448  | 05406 | 027211 |       | JMP MLOP2   | GO TO PROCESS NEXT WORD          |
| 0449* |       |        |       |             |                                  |
| 0450* |       |        |       |             |                                  |
| 0451* |       |        |       |             |                                  |
| 0452* |       |        |       |             |                                  |
| 0453* |       |        |       |             |                                  |
| 0454* |       |        |       |             |                                  |
| 0455* |       |        |       |             |                                  |
| 0456* |       |        |       |             |                                  |
| 0457* |       |        |       |             |                                  |
| 0458  | 05407 | 060115 | M1LOP | LDA FCORE   | ALL FORS                         |
| 0459  | 05410 | 050113 |       | CPA PBPTR   | MATCHED?                         |
| 0460  | 05411 | 002001 |       | RSS         | YES                              |
| 0461  | 05412 | 014477 |       | JSB ERROR   | NO                               |
| 0462  | 05413 | 064116 | MER6  | LDB SYMTF   |                                  |
| 0463* |       |        |       |             |                                  |
| 0464  | 05414 | 054117 | M2LOP | CPB SYMTA   | MORE SYMBOLS?                    |
| 0465  | 05415 | 027466 |       | JMP M4LOP   | NO                               |
| 0466  | 05416 | 160001 |       | LDA 1,I     | YES                              |
| 0467  | 05417 | 010336 |       | AND .15     | ACCONT FOR                       |
| 0468  | 05420 | 044325 |       | ADB .2      | A FUNCTION                       |
| 0469  | 05421 | 050336 |       | CPA .15     | IS IT?                           |
| 0470  | 05422 | 027414 |       | JMP M2LOP   | YES                              |
| 0471  | 05423 | 006004 |       | INB         | NO, ACCOUNT FOR                  |
| 0472  | 05424 | 040434 |       | ADA M4      | SIMPLE VARIABLE                  |
| 0473  | 05425 | 002025 |       | SSA,INA,RSS | IS IT?                           |
| 0474  | 05426 | 027414 |       | JMP M2LOP   | YES                              |
| 0475  | 05427 | 002003 |       | SZA,RSS     | NO, # OF SUBSCRIPTS KNOWN?       |
| 0476  | 05430 | 014477 |       | JSB ERROR   | NO                               |
| 0477  | 05431 | 002004 | MER10 | INA         | SAVE                             |
| 0478  | 05432 | 070160 |       | STA MBOX1+1 | FLAG                             |
| 0479  | 05433 | 074157 |       | STB MBOX1   | SAVE POINTER                     |
| 0480  | 05434 | 160001 |       | LDA 1,I     | DEFINED                          |
| 0481  | 05435 | 002002 |       | SZA         | ARRAY?                           |
| 0482  | 05436 | 027445 |       | JMP M3LOP   | YES                              |
| 0483  | 05437 | 063500 |       | LDA STDIM   | NO, LOAD                         |
| 0484  | 05440 | 034160 |       | ISZ MBOX1+1 | APPROPRIATE                      |
| 0485  | 05441 | 040333 |       | ADA .9      | STANDARD DIMENSIONS              |
| 0486  | 05442 | 170001 |       | STA 1,I     | RECORD AS                        |
| 0487  | 05443 | 044431 |       | ADB M1      | FORMAL AND ACTUAL                |

PAGE 0081 #05 PRE-EXECUTION PROCESSING

|       |       |        |       |             |                     |
|-------|-------|--------|-------|-------------|---------------------|
| 0488  | 05444 | 170001 |       | STA 1,I     | DIMENSIONS          |
| 0489  | 05445 | 015336 | M3LOP | JSB MDIM    | SAVE STORAGE        |
| 0490  | 05446 | 070160 |       | STA MBOX1+1 | REQUIREMENT         |
| 0491  | 05447 | 064157 |       | LDB MBOX1   | LOAD                |
| 0492  | 05450 | 044432 |       | ADB M2      | ADDRESS OF          |
| 0493  | 05451 | 160001 |       | LDA 1,I     | ELEMENT SPACE       |
| 0494  | 05452 | 002002 |       | SZA         | DEFINED IN COM?     |
| 0495  | 05453 | 027464 |       | JMP MER7    | YES                 |
| 0496  | 05454 | 060115 |       | LDA FCORE   | NO, USE CURRENT     |
| 0497  | 05455 | 170001 |       | STA 1,I     | FREE-CORE ADDRESS   |
| 0498  | 05456 | 040160 |       | ADA MBOX1+1 | UPDATE FREE-CORE    |
| 0499  | 05457 | 070115 |       | STA FCORE   | ADDRESS             |
| 0500  | 05460 | 003004 |       | CMA,INA     | OUT                 |
| 0501  | 05461 | 040116 |       | ADA SYMTF   | OF                  |
| 0502  | 05462 | 002020 |       | SSA         | SPACE?              |
| 0503  | 05463 | 014477 |       | JSB ERROR   | YES                 |
| 0504  | 05464 | 044326 | MER7  | ADB .3      | NO, ADVANCE POINTER |
| 0505  | 05465 | 027414 |       | JMP M2LOP   | TO NEXT ENTRY       |
| 0506* |       |        |       |             |                     |
| 0507  | 05466 | 064113 | M4LOP | LDB PBPTR   | INITIALIZE ALL      |
| 0508  | 05467 | 054115 |       | CPB FCORE   | ARRAY ELEMENTS      |
| 0509  | 05470 | 124203 |       | JMP FASE3,I | TO 'UNDEFINED'      |
| 0510  | 05471 | 060470 |       | LDA MNEG    |                     |
| 0511  | 05472 | 170001 |       | STA 1,I     |                     |
| 0512  | 05473 | 006004 |       | INB         |                     |
| 0513  | 05474 | 060471 |       | LDA MNEG+1  |                     |
| 0514  | 05475 | 170001 |       | STA 1,I     |                     |
| 0515  | 05476 | 006004 |       | INB         |                     |
| 0516  | 05477 | 027467 |       | JMP M4LOP+1 |                     |
| 0517* |       |        |       |             |                     |
| 0518  | 05500 | 005001 | STEIM | OCT 5001    |                     |

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0520*          *****
0521*          ENTER SYMBOL TABLE SUBROUTINE
0522*          *****
0523*
0524*          TRANSFER -(A) WORDS FROM THE BUFFER ADDRESSED
0525*          BY MBUF TO THE TOP OF THE SYMBOL TABLE.
0526*
0527 05501 000000 ESYMT NOP
0528 05502 071467          STA MBIN1          SAVE NEGATIVE OF LENGTH OF ENTRY
0529 05503 040116          ADA SYMTF
0530 05504 070116          STA SYMTF          MOVE SYMBOL TABLE START LOCATOR
0531 05505 071536          STA MBIN2          UP BY THE LENGTH OF ENTRY
0532 05506 003004          CMA,INA          CHECK THAT THE SYMBOL TABLE AND
0533 05507 040115          ADA FCORE          FOR TABLE DO NOT OVERLAP
0534 05510 002021          SSA,RSS
0535 05511 014477          JSB ERROR          OVERLAP ERROR
0536 05512 067543 MER8 LDB MBUF          POINTER TO REQD ENTRY
0537 05513 160001          LDA 1,I          TRANSFER ENTRY TO THE SYMBOL
0538 05514 171536          STA MBIN2,I      TABLE
0539 05515 006004          INB
0540 05516 035536          ISZ MBIN2
0541 05517 035467          ISZ MBIN1
0542 05520 027513          JMP MER8+1
0543 05521 127501          JMP ESYMT,I      RETURN
0544*
0545*          *****
0546*          SUBROUTINE TO SEARCH SYMBOL TABLE FOR AN ARRAY
0547*          *****
0548 05522 000000 MSYMT NOP          B GIVES ARRAY TYPE -3 = 1 DIM,
0549 05523 075467          STB MBIN1          -2 = 2DIM, -1 = UNDIMENSIONED
0550 05524 060157          LDA MBOX1          LOAD IDENTIFIER
0551 05525 114231          JSB SSYMA,I      SEARCH SYMBOL TABLE
0552 05526 006021          SSB,RSS
0553 05527 127522          JMP MSYMT,I      FOUND, RETURN
0554 05530 035467          ISZ MBIN1          IF ARRAY UNDIMENSIONED
0555 05531 002001          RSS
0556 05532 027541          JMP MSYM          JUMP TO NOT FOUND EXIT
0557 05533 035467          ISZ MBIN1          SET UP TO CHECK THAT ARRAY DOES
0558 05534 040325          ADA .2          NOT APPEAR IN THE TABLE WITH
0559 05535 040431          ADA M1          DIFFERENT DIMENSIONS. CHANGE
0560 05536 114231          JSB SSYMA,I      TYPE 2 TO 1 & TYPE 1 TO 2 AND
0561 05537 006021          SSB,RSS          SEARCH AGAIN
0562 05540 014477          JSB ERROR          FOUND, INCONSISTENT DIMENSIONS
0563 05541 037522 MSYM ISZ MSYMT          NOT FOUND, INCREMENT RETURN
0564 05542 127522          JMP MSYMT,I      ADDRESS AND RETURN
0565*
0566*
0567 05543 000157 MBUF DEF TEMPS
0568 00157 MBOX1 EQU TEMPS
0569 01467 MBIN1 EQU SLWST
0570 01536 MBIN2 EQU RSCHK
0571 00135 MPTR EQU SBPTR
0572 01515 MNPTR EQU OPCHK
0573 00170 COML EQU TEMPS+9
0574 00171 MWDNO EQU TEMPS+10
0575 05522 DIGCT EQU MSYMT

```

EXECUTE THE PROGRAM

```

0002*
0003***
0004** EVALUATE A FORMULA **
0005***
0006*
0007 05544 000000 FORMX NOP FORMULA BEGINS IN (TEMPS)
0008 05545 006400 CLB INITIALIZE OPERATOR
0009 05546 015467 JSB SLWST STACK
0010 05547 160157 FORM1 LDA TEMPS,I FETCH OPERAND
0011 05550 034157 ISZ TEMPS SET FOR NEXT WORD OF FORMULA
0012 05551 010425 AND OPDMK EXTRACT OPERAND
0013 05552 070165 STA TEMPS+6 AND SAVE IT
0014 05553 002003 SZB,RSS NULL OPERAND?
0015 05554 027567 JMP FORM2 YES
0016 05555 015476 JSB BHSTP SET STACK FOR OPERAND ADDRESS
0017 05556 002020 SSA FLAG BIT SET?
0018 05557 027636 JMP FORM4 YES
0019 05560 114231 JSB SSYMA,I FETCH OPERAND ADDRESS
0020 05561 006007 INB,SZB,RSS EXISTANT?
0021 05562 124267 JMP E8M1A,I NO
0022 05563 010336 AND .15 YES
0023 05564 050336 CPA .15 FUNCTION?
0024 05565 027651 JMP FORM6 YES
0025 05566 174142 STB HSTPT,I NO, STACK OPERAND ADDRESS
0026 05567 160157 FORM2 LDA TEMPS,I FETCH
0027 05570 010420 AND OPMSK OPERATOR
0028 05571 001727 ALF,ALF POSITION IT
0029 05572 064000 LDB 0 LOAD ADDRESS OF
0030 05573 044301 ADB FOPBS OPERATOR'S INFORMATION WORD
0031 05574 040440 ADA M8 NON-FORMULA
0032 05575 002020 SSA OPERATOR?
0033 05576 006400 CLB YES
0034 05577 040451 ADA D53 NO, NON-FORMULA
0035 05600 002021 SSA,RSS OPERATOR?
0036 05601 006400 CLB YES
0037 05602 002400 CLA NO
0038 05603 160001 LDA 1,I LOAD INFORMATION WORD
0039 05604 010401 AND MSK1 SAVE
0040 05605 070166 STA TEMPS+7 PRECEDENCE
0041 05606 120001 XOR 1,I SAVE
0042 05607 001100 ARS
0043 05610 070165 STA TEMPS+6 IDENTIFICATION
0044 05611 027617 JMP FOR11
0045 05612 170140 FORM0 STA TSTPT,I STACK HIGH WORD
0046 05613 000140 LDA TSTPT STACK OPERAND
0047 05614 170142 STA HSTPT,I ADDRESS
0048 05615 002004 INA STORE
0049 05616 174000 STB 0,I LOW WORD
0050 05617 160141 FOR11 LDA LSTPT,I DOES OPERATOR
0051 05620 010376 AND MSK0 ON TOP OF
0052 05621 003000 CMA OPERATOR STACK
0053 05622 040166 ADA TEMPS+7 HAVE HIGHER
0054 05623 002020 SSA PRECEDENCE?
0055 05624 027751 JMP FORM9 YES, EXECUTE IT
0056 05625 002001 RSS NO
0057 05626 034141 FOR10 ISZ LSTPT

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|      |       |        |       |            |                           |
|------|-------|--------|-------|------------|---------------------------|
| 0058 | 05627 | 064166 | LDB   | TEMPS+7    | RETRIEVE PRECEDENCE       |
| 0059 | 05630 | 044444 | ADB   | M15        | NO, LEFT PARENTHESIS      |
| 0060 | 05631 | 006020 | SSB   |            | OR LEFT BRACKET?          |
| 0061 | 05632 | 044336 | ADB   | .15        | NO, RESTORE PRECEDENCE    |
| 0062 | 05633 | 044165 | ADB   | TEMPS+6    | COMBINE IDENTIFICATION    |
| 0063 | 05634 | 015467 | JSB   | SLWST      | WITH PRECEDENCE AND STACK |
| 0064 | 05635 | 027547 | JMP   | FORM1      |                           |
| 0065 | 05636 | 050470 | FORM4 | CPA        | FLGBT                     |
| 0066 | 05637 | 027645 | JMP   | FORM5      | CONSTANT?                 |
| 0067 | 05640 | 010336 | AND   | .15        | YES                       |
| 0068 | 05641 | 050336 | CPA   | .15        | NO, PRE-DEFINED           |
| 0069 | 05642 | 027726 | JMP   | FORM7      | FUNCTION                  |
| 0070 | 05643 | 064170 | LDB   | TEMPS+9    | YES                       |
| 0071 | 05644 | 027566 | JMP   | FORM2-1    | NO, MUST BE A             |
| 0072 | 05645 | 064157 | FORM5 | LDB        | PARAMETER                 |
| 0073 | 05646 | 034157 | ISZ   | TEMPS      | LOAD CONSTANT ADDRESS     |
| 0074 | 05647 | 034157 | ISZ   | TEMPS      | MOVE POINTER TO           |
| 0075 | 05650 | 027566 | JMP   | FORM2-1    | NEXT CODE WORD            |
| 0076 | 05651 | 074165 | FORM6 | STB        | TEMPS+6                   |
| 0077 | 05652 | 064140 | LDB   | TSTPT      | SAVE SYMBOL TABLE POINTER |
| 0078 | 05653 | 015467 | JSB   | SLWST      | SAVE CURRENT POINTER      |
| 0079 | 05654 | 164165 | LDB   | TEMPS+6, I | TO TEMPORARY STACK        |
| 0080 | 05655 | 015467 | JSB   | SLWST      | SAVE FUNCTION ADDRESS     |
| 0081 | 05656 | 063544 | LDA   | FORMX      | SAVE CURRENT              |
| 0082 | 05657 | 170142 | STA   | HSTPT, I   | FORMX RETURN ADDRESS      |
| 0083 | 05660 | 017544 | JSB   | FORMX      | EVALUATE THE PARAMETER    |
| 0084 | 05661 | 034157 | ISZ   | TEMPS      | UPDATE FORMULA POINTER    |
| 0085 | 05662 | 034157 | ISZ   | TEMPS      | PAST RIGHT PARENTHESIS    |
| 0086 | 05663 | 060157 | LDA   | TEMPS      | SWITCH                    |
| 0087 | 05664 | 164141 | LDB   | LSTPT, I   | FORMULA POINTER           |
| 0088 | 05665 | 074157 | STB   | TEMPS      | TO FUNCTION'S             |
| 0089 | 05666 | 170141 | STA   | LSTPT, I   | FORMULA                   |
| 0090 | 05667 | 064170 | LDB   | TEMPS+9    | SET                       |
| 0091 | 05670 | 160142 | LDA   | HSTPT, I   | PARAMETER POINTER         |
| 0092 | 05671 | 034141 | ISZ   | LSTPT      | TO NEW PARAMETER,         |
| 0093 | 05672 | 034142 | ISZ   | HSTPT      | SAVING PREVIOUS           |
| 0094 | 05673 | 174141 | STB   | LSTPT, I   | SETTING ON                |
| 0095 | 05674 | 070170 | STA   | TEMPS+9    | LOW-CORE STACK            |
| 0096 | 05675 | 050140 | CPA   | TSTPT      | PROTECT PARAMETER IF      |
| 0097 | 05676 | 015536 | JSB   | RSCHK      | ON TEMPORARY STACK        |
| 0098 | 05677 | 017544 | JSB   | FORMX      | EVALUATE FUNCTION         |
| 0099 | 05700 | 160141 | LDA   | LSTPT, I   | RESTORE OLD               |
| 0100 | 05701 | 070170 | STA   | TEMPS+9    | PARAMETER POINTER         |
| 0101 | 05702 | 060141 | LDA   | LSTPT      | CUT BACK                  |
| 0102 | 05703 | 040433 | ADA   | M3         | LOW-CORE                  |
| 0103 | 05704 | 070141 | STA   | LSTPT      | STACK                     |
| 0104 | 05705 | 002004 | INA   |            | RESTORE ORIGINAL          |
| 0105 | 05706 | 164000 | LDB   | 0, I       | TEMPORARY STACK           |
| 0106 | 05707 | 074140 | STB   | TSTPT      | POINTER                   |
| 0107 | 05710 | 002004 | INA   |            | RESTORE                   |
| 0108 | 05711 | 164000 | LDB   | 0, I       | ORIGINAL                  |
| 0109 | 05712 | 074157 | STB   | TEMPS      | FORMULA POINTER           |
| 0110 | 05713 | 015505 | JSB   | STTOP      | POP RESULT                |

0112\*

0113\*\* PRE-DEFINED FUNCTIONS RETURN HERE WITH RESULT

0114\*

|      |       |        |       |             |                        |
|------|-------|--------|-------|-------------|------------------------|
| 0115 | 05714 | 170140 | FOR12 | STA TSTPT,I | STORE HIGH WORD        |
| 0116 | 05715 | 060140 |       | LDA TSTPT   |                        |
| 0117 | 05716 | 002004 |       | INA         | STORE                  |
| 0118 | 05717 | 174000 |       | STB 0,I     | LOW WORD               |
| 0119 | 05720 | 034142 |       | ISZ HSTPT   |                        |
| 0120 | 05721 | 164142 |       | LDB HSTPT,I | RESTORE FORMX          |
| 0121 | 05722 | 077544 |       | STB FORMX   | RETURN ADDRESS         |
| 0122 | 05723 | 040431 |       | ADA M1      | STACK ADDRESS          |
| 0123 | 05724 | 170142 |       | STA HSTPT,I | OF RESULT              |
| 0124 | 05725 | 027567 |       | JMP FORM2   |                        |
| 0125 | 05726 | 060165 | FORM7 | LDA TEMPS+6 | COMPUTE                |
| 0126 | 05727 | 001727 |       | ALF,ALF     |                        |
| 0127 | 05730 | 001700 |       | ALF         | FUNCTION               |
| 0128 | 05731 | 010344 |       | AND .31     |                        |
| 0129 | 05732 | 040305 |       | ADA PDFBS   | ADDRESS                |
| 0130 | 05733 | 164000 |       | LDB 0,I     |                        |
| 0131 | 05734 | 015467 |       | JSB SLWST   | SAVE FUNCTION ADDRESS  |
| 0132 | 05735 | 063544 |       | LDA FORMX   | SAVE CURRENT           |
| 0133 | 05736 | 170142 |       | STA HSTPT,I | FORMX RETURN ADDRESS   |
| 0134 | 05737 | 017544 |       | JSB FORMX   | EVALUATE THE PARAMETER |
| 0135 | 05740 | 034157 |       | ISZ TEMPS   | UPDATE FORMULA POINTER |
| 0136 | 05741 | 034157 |       | ISZ TEMPS   | PAST RIGHT PARENTHESIS |
| 0137 | 05742 | 164141 |       | LDB LSTPT,I | POP                    |
| 0138 | 05743 | 003400 |       | CCA         | FUNCTION               |
| 0139 | 05744 | 040141 |       | ADA LSTPT   | ENTRY                  |
| 0140 | 05745 | 070141 |       | STA LSTPT   | ADDRESS                |
| 0141 | 05746 | 077501 |       | STB ESYM    | SAVE                   |
| 0142 | 05747 | 015505 |       | JSB STTOP   | POP PARAMETER          |
| 0143 | 05750 | 127501 |       | JMP ESYM,I  | EVALUATE FUNCTION      |
| 0144 | 05751 | 160141 | FORM9 | LDA LSTPT,I | UNSTACK                |
| 0145 | 05752 | 007400 |       | CCB         | OPERATOR               |
| 0146 | 05753 | 044141 |       | ADB LSTPT   | INFORMATION            |
| 0147 | 05754 | 074141 |       | STB LSTPT   | WORD                   |
| 0148 | 05755 | 001727 |       | ALF,ALF     | COMPUTE                |
| 0149 | 05756 | 010374 |       | AND B177    | SUBROUTINE             |
| 0150 | 05757 | 040304 |       | ADA ARBAS   | ADDRESS                |
| 0151 | 05760 | 124000 |       | JMP 0,I     | EXECUTE                |

0152\*\*

0153\*\*\* EXECUTION BRANCH TABLE \*\*

0154\*\*

|      |       |        |       |             |        |
|------|-------|--------|-------|-------------|--------|
| 0155 | 05761 | 006203 | XECTB | DEF ELET    | LET    |
| 0156 | 05762 | 006044 |       | DEF XEC4    | DIM    |
| 0157 | 05763 | 006044 |       | DEF XEC4    | COM    |
| 0158 | 05764 | 006044 |       | DEF XEC4    | DEF    |
| 0159 | 05765 | 006044 |       | DEF XEC4    | REM    |
| 0160 | 05766 | 006205 |       | DEF EGOTO   | GO TO  |
| 0161 | 05767 | 006210 |       | DEF EIF     | IF     |
| 0162 | 05770 | 006216 |       | DEF EFOR    | FOR    |
| 0163 | 05771 | 006312 |       | DEF ENEXT   | NEXT   |
| 0164 | 05772 | 006353 |       | DEF EGOSB   | GOSUB  |
| 0165 | 05773 | 006364 |       | DEF ERTRN   | RETURN |
| 0166 | 05774 | 100205 |       | DEF RDYDA,I | END    |
| 0167 | 05775 | 100205 |       | DEF RDYDA,I | STOP   |

PAGE 0086 #06 EXECUTE THE PROGRAM

|  |       |        |                |                         |
|--|-------|--------|----------------|-------------------------|
| 0168                                   | 05776 | 006373 | DEF EWAIT      | WAIT                    |
| 0169                                   | 05777 | 006412 | DEF ECALL      | CALL                    |
| 0170                                   | 06000 | 006044 | DEF XEC4       | DATA                    |
| 0171                                   | 06001 | 006441 | DEF EREAD      | READ                    |
| 0172                                   | 06002 | 006474 | DEF EPRIN      | PRINT                   |
| 0173                                   | 06003 | 006643 | DEF EINPT      | INPUT                   |
| 0174                                   | 06004 | 006656 | DEF ERSTR      | RESTORE                 |
| 0175                                   | 06005 | 011456 | DEF EMAT       | MAT                     |
| 0176*                                  |       |        |                |                         |
| 0177* *****                            |       |        |                |                         |
| 0178****                               |       |        |                |                         |
| 0179*** EXECUTE THE PROGRAM ***        |       |        |                |                         |
| 0180****                               |       |        |                |                         |
| 0181* *****                            |       |        |                |                         |
| 0182*                                  |       |        |                |                         |
| 0183**                                 |       |        |                |                         |
| 0184***INITIALIZE FOR OUTPUT **        |       |        |                |                         |
| 0185**                                 |       |        |                |                         |
| 0186                                   | 06006 | 002400 | XEC CLA        | SET COUNTER FOR         |
| 0187                                   | 06007 | 070146 | STA TYPE       | CHARACTERS OUTPUTTED    |
| 0188                                   | 06010 | 070155 | STA XH         | INITIALIZE              |
| 0189                                   | 06011 | 002004 | INA            | RANDOM                  |
| 0190                                   | 06012 | 070156 | STA XL         | VARIABLE                |
| 0191**                                 |       |        |                |                         |
| 0192*** INITIALIZE THE DATA POINTER ** |       |        |                |                         |
| 0193**                                 |       |        |                |                         |
| 0194                                   | 06013 | 003400 | CCA            | SET                     |
| 0195                                   | 06014 | 070151 | STA DCCNT      | 'NO                     |
| 0196                                   | 06015 | 070147 | STA DSTRT      | DATA'                   |
| 0197                                   | 06016 | 064112 | LDB PBUFF      | CONDITION               |
| 0198                                   | 06017 | 074150 | STB NXTDT      |                         |
| 0199                                   | 06020 | 160315 | LDA ADATA, I   | SEARCH FOR FIRST        |
| 0200                                   | 06021 | 016105 | JSB STSRH      | DATA STATEMENT          |
| 0201                                   | 06022 | 026025 | JMP XEC2       | NONE FOUND              |
| 0202                                   | 06023 | 074147 | STB DSTRT      | SAVE STATEMENT LOCATION |
| 0203                                   | 06024 | 016074 | JSB SETDP      | SET DATA POINTER        |
| 0204**                                 |       |        |                |                         |
| 0205*** INITIALIZE STACK POINTERS **   |       |        |                |                         |
| 0206**                                 |       |        |                |                         |
| 0207                                   | 06025 | 064116 | XEC2 LDB SYMTF | INITIALIZE              |
| 0208                                   | 06026 | 074142 | STB HSTPT      | POINTERS TO             |
| 0209                                   | 06027 | 064115 | LDB FCORE      | 'HIGH CORE' STACK,      |
| 0210                                   | 06030 | 074140 | STB TSTPT      | 'TEMPORARY'             |
| 0211                                   | 06031 | 044337 | ADB .23        | STACK, AND              |
| 0212                                   | 06032 | 074120 | STB LSTAK      | 'LOW CORE'              |
| 0213                                   | 06033 | 074141 | STB LSTPT      | STACK                   |
| 0214                                   | 06034 | 007000 | CM0            | DO                      |
| 0215                                   | 06035 | 044142 | ADB HSTPT      | STACKS                  |
| 0216                                   | 06036 | 006020 | SSB            | MEET?                   |
| 0217                                   | 06037 | 025473 | JMP E1         | YES                     |
| 0218                                   | 06040 | 064426 | LDB RMODE      | NO, SHIFT TO            |
| 0219                                   | 06041 | 074127 | STB LISTR      | RUN MODE                |
| 0220                                   | 06042 | 064112 | LDB PBUFF      | BEGIN                   |
| 0221                                   | 06043 | 026054 | JMP XEC5       | EXECUTION               |



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0223**
0224*** FIND NEXT STATEMENT TO BE EXECUTED **
0225**
0226 06044 060144 XEC4 LDA NXTST NEXT STATEMENT NUMBER
0227 06045 064143 LDB PRADD PROSPECTIVE ADDRESS
0228 06046 150001 CPA 1,I DESIRED STATEMENT?
0229 06047 026055 JMP XEC6 YES
0230 06050 064112 LDB PBUFF NO, FIND
0231 06051 114213 JSB FNDPA,I STATEMENT
0232 06052 000000 NOP NON-EXISTENT
0233 06053 014477 JSB ERROR STATEMENT
0234 06054 160001 XEC5 LDA 1,I SAVE NEW
0235 06055 070145 XEC6 STA .LNUM SEQUENCE NUMBER
0236**
0237*** SET SUCCESSOR STATEMENT **
0238**
0239 06056 016147 JSB FLWST
0240 06057 010420 AND OPMSK EXTRACT STATEMENT TYPE
0241 06060 001727 ALF,ALF POSITION
0242 06061 001300 RAR IT
0243 06062 040303 ADA XECBR COMPUTE EXECUTION ADDRESS
0244 06063 124000 JMP 0,I BRANCH TO EXECUTION CODE
0245**
0246*** EVALUATE FORMULA AND RETURN RESULT **
0247**
0248 06064 000000 FETCH NOP
0249 06065 114233 JSB FORMA,I EVALUATE FORMULA
0250 06066 015515 JSB OPCHK
0251 06067 034142 ISZ HSTPT UNSTACK RESULT ADDRESS
0252 06070 160001 LDA 1,I LOAD (A) WITH HIGH MANTISSA
0253 06071 006004 INB LOAD LOW PART
0254 06072 164001 LDB 1,I OF RESULT INTO (B)
0255 06073 126064 JMP FETCH,I EXIT
0256**
0257*** SET POINTER TO START OF DATA STATEMENT **
0258**
0259 06074 000000 SETDP NOP STATEMENT ADDRESS IN (B)
0260 06075 006004 INB LOAD
0261 06076 160001 LDA 1,I STATEMENT LENGTH
0262 06077 003004 CMA,INA SET
0263 06100 002004 INA DATA COUNTER
0264 06101 070151 STA DCCNT TO 1-STATEMENT LENGTH
0265 06102 006004 INB SET 'NEXT DATA' POINTER ONE
0266 06103 074150 STB NXTDT WORD ABOVE FIRST CONSTANT
0267 06104 126074 JMP SETDP,I
0268**
0269*** SEARCH FOR STATEMENT OF GIVEN TYPE **
0270**
0271 06105 000000 STSRH NOP TYPE IN (A), ADDRESS IN (B)
0272 06106 010420 AND OPMSK EXTRACT
0273 06107 070164 STA TEMP4 STATEMENT TYPE
0274 06110 060001 STSR1 LDA 1 EXTRACT
0275 06111 040325 ADA .2 PROGRAM
0276 06112 160000 LDA 0,I STATEMENT
0277 06113 010420 AND OPMSK TYPE
0278 06114 050164 CPA TEMP4 DESIRED TYPE?

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|  |       |        |       |           |                           |
|--|-------|--------|-------|-----------|---------------------------|
| 0279   | 06115 | 026124 | JMP   | STSR2     | YES                       |
| 0280   | 06116 | 060001 | LDA   | 1         | NO, FETCH                 |
| 0281   | 06117 | 002004 | INA   |           | STATEMENT LENGTH          |
| 0282   | 06120 | 144000 | ADB   | 0,I       | COMPUTE NEW ADDRESS       |
| 0283   | 06121 | 054113 | CPB   | PBPTR     | PAST LAST STATEMENT?      |
| 0284   | 06122 | 126105 | JMP   | STSRH,I   | YES                       |
| 0285   | 06123 | 026110 | JMP   | STSR1     | NO                        |
| 0286   | 06124 | 036105 | STSR2 | ISZ STSRH |                           |
| 0287   | 06125 | 126105 | JMP   | STSRH,I   |                           |
| 0288**   |       |        |       |           |                           |
| 0289*** FETCH A DATA ITEM **                   |       |        |       |           |                           |
| 0290**   |       |        |       |           |                           |
| 0291   | 06126 | 000000 | FDATA | NOP       |                           |
| 0292   | 06127 | 034151 | FDAT1 | ISZ DCCNT | MORE DATA?                |
| 0293   | 06130 | 026137 | JMP   | FDAT2     | YES                       |
| 0294   | 06131 | 160315 | LDA   | ADATA,I   | NO, SEARCH                |
| 0295   | 06132 | 064150 | LDB   | NXTDT     | FOR NEXT                  |
| 0296   | 06133 | 016105 | JSB   | STSRH     | DATA STATEMENT            |
| 0297   | 06134 | 014477 | JSB   | ERROR     | NONE FOUND                |
| 0298   | 06135 | 016074 | E4    | JSB SETDP | INITIALIZE THE            |
| 0299   | 06136 | 026127 | JMP   | FDAT1     | DATA POINTERS             |
| 0300   | 06137 | 034151 | FDAT2 | ISZ DCCNT | UPDATE                    |
| 0301   | 06140 | 034151 |       | ISZ DCCNT | POINTER                   |
| 0302   | 06141 | 034150 |       | ISZ NXTDT |                           |
| 0303   | 06142 | 160150 | LDA   | NXTDT,I   | LOAD                      |
| 0304   | 06143 | 034150 |       | ISZ NXTDT | DATA                      |
| 0305   | 06144 | 164150 | LDB   | NXTDT,I   | ITEM                      |
| 0306   | 06145 | 034150 |       | ISZ NXTDT | UPDATE POINTER            |
| 0307   | 06146 | 126126 | JMP   | FDATA,I   |                           |
| 0308**   |       |        |       |           |                           |
| 0309*** SET FOR FOLLOWING STATEMENT **         |       |        |       |           |                           |
| 0310**   |       |        |       |           |                           |
| 0311   | 06147 | 000000 | FLWST | NOP       | (B) HOLDS PRESENT ADDRESS |
| 0312   | 06150 | 060001 | LDA   | 1         | COMPUTE                   |
| 0313   | 06151 | 002004 | INA   |           | ADDRESS                   |
| 0314   | 06152 | 160000 | LDA   | 0,I       | OF                        |
| 0315   | 06153 | 040001 | ADA   | 1         | NEXT                      |
| 0316   | 06154 | 070143 | STA   | PRADD     | STATEMENT                 |
| 0317   | 06155 | 160000 | LDA   | 0,I       | RECORD THE                |
| 0318   | 06156 | 070144 | STA   | NXTST     | SEQUENCE NUMBER           |
| 0319   | 06157 | 044325 | ADB   | .2        | FETCH                     |
| 0320   | 06160 | 074157 | STB   | TEMPS     | FIRST WORD                |
| 0321   | 06161 | 160001 | LDA   | 1,I       | OF CURRENT                |
| 0322   | 06162 | 126147 | JMP   | FLWST,I   | STATEMENT                 |
| 0323**   |       |        |       |           |                           |
| 0324*** SEARCH STACK FOR GIVEN FOR-VARIABLE ** |       |        |       |           |                           |
| 0325**   |       |        |       |           |                           |
| 0326   | 06163 | 000000 | FVSRH | NOP       |                           |
| 0327   | 06164 | 160157 | LDA   | TEMPS,I   | FETCH                     |
| 0328   | 06165 | 010401 | AND   | MSK1      | FOR-VARIABLE              |
| 0329   | 06166 | 071656 | STA   | EDELM     | SAVE FOR-VARIABLE         |
| 0330   | 06167 | 114231 | JSB   | SSYMA,I   | FIND ADDRESS IN           |
| 0331   | 06170 | 006004 | INB   |           | SYMBOL TABLE              |
| 0332   | 06171 | 060142 | LDA   | HSTPT     | SAVE                      |
| 0333   | 06172 | 070163 | STA   | TEMP3     | STACK TOP                 |
| 0334   | 06173 | 050116 | FVSR1 | CPA SYMTF | STACK BOTTOM?             |

|         |               |        |       |             |                                |
|---------|---------------|--------|-------|-------------|--------------------------------|
| 0335    | 06174         | 126163 |       | JMP FVSRH,I | YES, EXIT VIA (P+1)            |
| 0336    | 06175         | 154000 |       | CPB 0,I     | MATCHING FOR-VARIABLE?         |
| 0337    | 06176         | 026201 |       | JMP FVSR2   | YES                            |
| 0338    | 06177         | 040330 |       | ADA .6      | NO, MOVE TO                    |
| 0339    | 06200         | 026173 |       | JMP FVSR1   | NEXT STACK ENTRY               |
| 0340    | 06201         | 036163 | FVSR2 | ISZ FVSRH   | EXIT                           |
| 0341    | 06202         | 126163 |       | JMP FVSRH,I | VIA (P+2)                      |
| 0342*   |               |        |       |             |                                |
| 0343*** |               |        | ***   |             |                                |
| 0344**  | EXECUTE LET   |        | **    |             |                                |
| 0345*** |               |        | ***   |             |                                |
| 0346*   |               |        |       |             |                                |
| 0347    | 06203         | 114233 | ELET  | JSB FORMA,I |                                |
| 0348    | 06204         | 026044 |       | JMP XEC4    |                                |
| 0349*   |               |        |       |             |                                |
| 0350*** |               |        | ***   |             |                                |
| 0351**  | EXECUTE GO TO |        | **    |             |                                |
| 0352*** |               |        | ***   |             |                                |
| 0353*   |               |        |       |             |                                |
| 0354    | 06205         | 006004 | EGCTO | INB         | LOAD SEQUENCE                  |
| 0355    | 06206         | 160001 |       | LDA 1,I     | NUMBER                         |
| 0356    | 06207         | 026045 |       | JMP XEC4+1  | FIND REFERENCED STATEMENT      |
| 0357*   |               |        |       |             |                                |
| 0358*** |               |        | ***   |             |                                |
| 0359**  | EXECUTE IF    |        | **    |             |                                |
| 0360*** |               |        | ***   |             |                                |
| 0361*   |               |        |       |             |                                |
| 0362    | 06210         | 114232 | EIF   | JSB FETCA,I | FETCH VALUE OF FORMULA         |
| 0363    | 06211         | 002003 |       | SZA,RSS     | RESULTANT TRUE?                |
| 0364    | 06212         | 026044 |       | JMP XEC4    | NO                             |
| 0365    | 06213         | 034157 |       | ISZ TEMPS   | YES, BRANCH TO                 |
| 0366    | 06214         | 064157 |       | LDB TEMPS   | FOLLOWING                      |
| 0367    | 06215         | 026205 |       | JMP EGOTO   | SEQUENCE NUMBER                |
| 0368*   |               |        |       |             |                                |
| 0369*** |               |        | ***   |             |                                |
| 0370**  | EXECUTE FOR   |        | **    |             |                                |
| 0371*** |               |        | ***   |             |                                |
| 0372*   |               |        |       |             |                                |
| 0373    | 06216         | 016163 | EFCR  | JSB FVSRH   | FOR-VARIABLE ALREADY IN STACK? |
| 0374    | 06217         | 026230 |       | JMP EFOR1   | NO                             |
| 0375    | 06220         | 070162 |       | STA TEMP2   | YES, SAVE SOURCE ADDRESS       |
| 0376    | 06221         | 040330 |       | ADA .6      | SAVE                           |
| 0377    | 06222         | 070164 |       | STA TEMP4   | DESTINATION ADDRESS            |
| 0378    | 06223         | 074161 |       | STB TEMP1   | SAVE FOR-VARIABLE ADDRESS      |
| 0379    | 06224         | 014554 |       | JSB MVTOH   | COMPRESS STACK                 |
| 0380    | 06225         | 064161 |       | LDB TEMP1   | RESTORE FOR-VARIABLE ADDRESS   |
| 0381    | 06226         | 002400 |       | CLA         | COMPUTE                        |
| 0382    | 06227         | 002401 |       | CLA,RSS     | COMPUTE                        |
| 0383    | 06230         | 060436 | EFCR1 | LDA M6      | NEW TOP OF                     |
| 0384    | 06231         | 040142 |       | ADA HSTPT   | FOR-STACK                      |
| 0385    | 06232         | 070142 |       | STA HSTPT   | POINTER                        |
| 0386    | 06233         | 070161 |       | STA TEMP1   |                                |
| 0387    | 06234         | 003004 |       | CMA,INA     | STACK                          |
| 0388    | 06235         | 040141 |       | ADA LSTPT   |                                |
| 0389    | 06236         | 002021 |       | SSA,RSS     | OVERFLOW?                      |
| 0390    | 06237         | 025473 |       | JMP E1      | YES                            |

|         |              |        |                   |                                 |
|---------|--------------|--------|-------------------|---------------------------------|
| 0391    | 06240        | 174161 | STB TEMP1,I       | NO, RECORD FOR-VARIABLE ADDRESS |
| 0392    | 06241        | 114233 | JSB FORMA,I       | INITIALIZE FOR-VARIABLE         |
| 0393    | 06242        | 034157 | ISZ TEMPS         |                                 |
| 0394    | 06243        | 034161 | ISZ TEMP1         | SAVE                            |
| 0395    | 06244        | 060161 | LDA TEMP1         | LIMIT                           |
| 0396    | 06245        | 072340 | STA ENEX2         | ADDRESS                         |
| 0397    | 06246        | 114232 | JSB FETCA,I       | FETCH                           |
| 0398    | 06247        | 170161 | STA TEMP1,I       | AND                             |
| 0399    | 06250        | 034161 | ISZ TEMP1         | STORE                           |
| 0400    | 06251        | 174161 | STB TEMP1,I       | LIMIT                           |
| 0401    | 06252        | 034161 | ISZ TEMP1         |                                 |
| 0402    | 06253        | 064432 | LDB M2            | SET FOR STEP SIZE               |
| 0403    | 06254        | 076126 | STB FDATA         | SIGN CHECK                      |
| 0404    | 06255        | 160157 | LDA TEMPS,I       | LOOK FOR                        |
| 0405    | 06256        | 002002 | SZA               | FOLLOWING 'STEP'                |
| 0406    | 06257        | 026263 | JMP EFOR2         | FOUND                           |
| 0407    | 06260        | 060466 | LDA HONE          | NOT FOUND,                      |
| 0408    | 06261        | 064325 | LDB .2            | DEFAULT                         |
| 0409    | 06262        | 002001 | RSS               | IS 1.0                          |
| 0410    | 06263        | 114232 | EFOR2 JSB FETCA,I |                                 |
| 0411    | 06264        | 002020 | SSA               | STEP SIZE NEGATIVE?             |
| 0412    | 06265        | 036126 | ISZ FDATA         | YES                             |
| 0413    | 06266        | 170161 | STA TEMP1,I       | SAVE                            |
| 0414    | 06267        | 034161 | ISZ TEMP1         | STEP                            |
| 0415    | 06270        | 174161 | STB TEMP1,I       | SIZE                            |
| 0416    | 06271        | 034161 | ISZ TEMP1         | SET POINTER                     |
| 0417    | 06272        | 060144 | LDA NXTST         | TO STATEMENT                    |
| 0418    | 06273        | 170161 | STA TEMP1,I       | FOLLOWING THE FOR               |
| 0419    | 06274        | 160314 | EFOR3 LDA ANEXT,I | FIND                            |
| 0420    | 06275        | 064143 | LDB PRADD         | 'NEXT'                          |
| 0421    | 06276        | 016105 | JSB STSRH         | STATEMENT                       |
| 0422    | 06277        | 000000 | NOP               |                                 |
| 0423    | 06300        | 016147 | JSB FLWST         | FIND FOLLOWING STATEMENT        |
| 0424    | 06301        | 010401 | AND MSK1          | SAME                            |
| 0425    | 06302        | 051656 | CPA EDELM         | FOR-VARIABLE?                   |
| 0426    | 06303        | 002001 | RSS               | YES                             |
| 0427    | 06304        | 026274 | JMP EFOR3         | NO                              |
| 0428    | 06305        | 164142 | LDB HSTPT,I       | LOAD                            |
| 0429    | 06306        | 160001 | LDA 1,I           | VALUE                           |
| 0430    | 06307        | 006004 | INB               | OF                              |
| 0431    | 06310        | 164001 | LDB 1,I           | FOR-VARIABLE                    |
| 0432    | 06311        | 026337 | JMP ENEX2-1       | CHECK ACCEPTABILITY             |
| 0433*   |              |        |                   |                                 |
| 0434*** |              |        | ***               |                                 |
| 0435**  | EXECUTE NEXT |        | **                |                                 |
| 0436*** |              |        | ***               |                                 |
| 0437*   |              |        |                   |                                 |
| 0438    | 06312        | 016163 | ENEXT JSB FVSRH   | FIND CORRESPONDING STACK ENTRY  |
| 0439    | 06313        | 026044 | JMP XEC4          | NONE PRESENT                    |
| 0440    | 06314        | 070142 | STA HSTPT         | RESET TOP OF STACK              |
| 0441    | 06315        | 076333 | STB ENEX1         | SAVE FOR-VARIABLE ADDRESS       |
| 0442    | 06316        | 002004 | INA               | SAVE LIMIT                      |
| 0443    | 06317        | 072340 | STA ENEX2         | ADDRESS                         |
| 0444    | 06320        | 040325 | ADA .2            | SAVE STEP SIZE                  |
| 0445    | 06321        | 070161 | STA TEMP1         | ADDRESS                         |
| 0446    | 06322        | 064432 | LDB M2            | SET STEP SIZE                   |

|         |                |        |       |             |                                |
|---------|----------------|--------|-------|-------------|--------------------------------|
| 0447    | 06323          | 076126 |       | STB FDATA   | SIGN CHECK                     |
| 0448    | 06324          | 160161 |       | LDA TEMP1,I | LOAD                           |
| 0449    | 06325          | 034161 |       | ISZ TEMP1   | STEP                           |
| 0450    | 06326          | 164161 |       | LDB TEMP1,I | SIZE                           |
| 0451    | 06327          | 034161 |       | ISZ TEMP1   |                                |
| 0452    | 06330          | 002020 |       | SSA         | CHECK                          |
| 0453    | 06331          | 036126 |       | ISZ FDATA   | SIGN                           |
| 0454    | 06332          | 017343 |       | JSB .FAD    | INCREMENT                      |
| 0455    | 06333          | 000000 | ENEX1 | NOP         | FOR-VARIABLE                   |
| 0456    | 06334          | 172333 |       | STA ENEX1,I | AND                            |
| 0457    | 06335          | 036333 |       | ISZ ENEX1   | SAVE                           |
| 0458    | 06336          | 176333 |       | STB ENEX1,I | VALUE                          |
| 0459    | 06337          | 017347 |       | JSB .FSB    | COMPUTE FOR-VARIABLE - LIMIT   |
| 0460    | 06340          | 000000 | ENEX2 | NOP         |                                |
| 0461    | 06341          | 036126 |       | ISZ FDATA   | POSITIVE STEP SIZE?            |
| 0462    | 06342          | 001600 |       | ELA         | YES, COMPLEMENT SIGN           |
| 0463    | 06343          | 002020 |       | SSA         | NO, NON-NEGATIVE RESULT?       |
| 0464    | 06344          | 026347 |       | JMP ENEX3   | NO                             |
| 0465    | 06345          | 160161 |       | LDA TEMP1,I | YES, GO TO FIRST               |
| 0466    | 06346          | 026045 |       | JMP XEC4+1  | STATEMENT OF LOOP              |
| 0467    | 06347          | 060142 | ENEX3 | LDA HSTPT   | FAILS,                         |
| 0468    | 06350          | 040330 |       | ADA .6      | ERASE                          |
| 0469    | 06351          | 070142 |       | STA HSTPT   | STACK                          |
| 0470    | 06352          | 026044 |       | JMP XEC4    | ENTRY                          |
| 0471*   |                |        |       |             |                                |
| 0472*** |                |        | ***   |             |                                |
| 0473**  | EXECUTE GOSUB  |        | **    |             |                                |
| 0474*** |                |        | ***   |             |                                |
| 0475*   |                |        |       |             |                                |
| 0476    | 06353          | 006004 | EGCSB | INB         | LOAD (A) WITH                  |
| 0477    | 06354          | 160001 |       | LDA 1,I     | SEQUENCE NUMBER                |
| 0478    | 06355          | 064144 |       | LDB NXTST   | LOAD (B) WITH                  |
| 0479    | 06356          | 070144 |       | STA NXTST   | RETURN SEQUENCE NUMBER         |
| 0480    | 06357          | 015467 |       | JSB SLWST   | STACK RETURN ON LOW-CORE STACK |
| 0481    | 06360          | 040442 |       | ADA M10     | GOSUBS NESTED                  |
| 0482    | 06361          | 050120 |       | CPA LSTAK   | 10 DEEP?                       |
| 0483    | 06362          | 014477 |       | JSB ERROR   | YES                            |
| 0484    | 06363          | 026044 | E2    | JMP XEC4    | NO                             |
| 0485*   |                |        |       |             |                                |
| 0486*** |                |        | ***   |             |                                |
| 0487**  | EXECUTE RETURN |        | **    |             |                                |
| 0488*** |                |        | ***   |             |                                |
| 0489*   |                |        |       |             |                                |
| 0490    | 06364          | 064141 | ERTRN | LDB LSTPT   | RETURN STACK                   |
| 0491    | 06365          | 054120 |       | CPB LSTAK   | EMPTY?                         |
| 0492    | 06366          | 014477 |       | JSB ERROR   | YES                            |
| 0493    | 06367          | 160141 | E3    | LDA LSTPT,I | NO, LOAD RETURN ADDRESS        |
| 0494    | 06370          | 044431 |       | ADB M1      | RESET                          |
| 0495    | 06371          | 074141 |       | STB LSTPT   | STACK POINTER                  |
| 0496    | 06372          | 026045 |       | JMP XEC4+1  |                                |

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0498*
0499***
0500** EXECUTE WAIT **
0501***
0502*
0503 06373 034157 EWAIT ISZ TEMPS POINT (TEMPS) TO FORMULA
0504 06374 114232 JSB FETCA,I FETCH EVALUATED FORMULA
0505 06375 002020 SSA NEGATIVE?
0506 06376 026044 JMP XEC4 YES
0507 06377 015364 JSB IFIX CONVERT TO INTEGER
0508 06400 002404 CLA,INA LARGE INTEGER
0509 06401 002003 SZA,RSS SMALL
0510 06402 007021 CMB,SSB,RSS INTEGER?
0511 06403 064470 LDB MNEG NO
0512 06404 006007 EWAIT1 INB,SZB,RSS WAIT?
0513 06405 026044 JMP XEC4 NO
0514 06406 060461 LDA M310 YES, SET INNER LOOP
0515 06407 002006 INA,SZA MORE?
0516 06410 026407 JMP *-1 YES
0517 06411 026404 JMP EWAIT1 NO
0518*
0519***
0520** EXECUTE CALL **
0521***
0522*
0523 06412 034157 ECALL ISZ TEMPS FETCH
0524 06413 034157 ISZ TEMPS SUBROUTINE
0525 06414 164157 LDB TEMPS,I NUMBER
0526 06415 015323 JSB FND5B FIND
0527 06416 006004 INB ENTRY
0528 06417 164001 LDB 1,I POINT AND
0529 06420 074172 STB TEMPS+11 SAVE IT
0530 06421 060142 LDA HSTPT SAVE HIGH CORE
0531 06422 070171 STA TEMPS+10 STACK POINTER
0532 06423 034157 ECAL1 ISZ TEMPS ANY
0533 06424 160157 LDA TEMPS,I PARAMETERS
0534 06425 050406 CPA B4000 LEFT?
0535 06426 026431 JMP ECAL2 NO
0536 06427 114233 JSB FORMA,I YES, EVALUATE
0537 06430 026423 JMP ECAL1 A PARAMETER
0538 06431 003400 ECAL2 CCA LOAD ADDRESS OF
0539 06432 040171 ADA TEMPS+10 PARAMETER ADDRESSES
0540 06433 114172 JSB TEMPS+11,I AND BRANCH TO SUBROUTINE
0541 06434 060171 LDA TEMPS+10 RESTORE
0542 06435 070142 STA HSTPT
0543 06436 064115 LDB FCORE POINTERS
0544 06437 074140 STB TSTPT
0545 06440 026044 JMP XEC4

```

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0547*
0548***
0549** EXECUTE READ **
0550***
0551*
0552 06441 054143 EREAD CPB PRADD END-OF-STATEMENT?
0553 06442 026044 JMP XEC4 YES
0554 06443 114233 JSB FORMA,I NO, EVALUATE NEXT ADDRESS
0555 06444 160142 LDA HSTPT,I RECORD
0556 06445 071677 STA OUTLN ADDRESS
0557 06446 016126 JSB FDATA GET DATA ITEM
0558 06447 171677 STA OUTLN,I STORE
0559 06450 035677 ISZ OUTLN DATA
0560 06451 175677 STB OUTLN,I ITEM
0561 06452 034142 ISZ HSTPT
0562 06453 064157 LDB TEMPS
0563 06454 006004 INB
0564 06455 026441 JMP EREAD
0565**
0566*** INITIALIZE FOR PRINT **
0567**
0568 06456 000000 PRNIN NOP
0569 06457 003400 CCA INITIALIZE
0570 06460 040131 ADA .BUFA BUFFER
0571 06461 070132 STA BADDR POINTER
0572 06462 060146 LDA TYPE INITIALIZE
0573 06463 003004 CMA,INA 'CHARACTERS OUTPUTTED'
0574 06464 070133 STA CCNT COUNTER
0575 06465 002011 SLA,RSS START ON ODD CHARACTER POSITION?
0576 06466 126456 JMP PRNIN,I NO
0577 06467 040431 ADA M1 YES, BIAS
0578 06470 070133 STA CCNT COUNTER
0579 06471 002400 CLA OUTPUT A
0580 06472 015715 JSB OUTCR NULL CHARACTER
0581 06473 126456 JMP PRNIN,I
0582*
0583***
0584** EXECUTE PRINT **
0585***
0586*
0587 06474 016456 EPRIN JSB PRNIN SET FOR PRINT
0588 06475 002400 CLA TURN ON
0589 06476 026503 JMP EPR11+1 'END-OF-LINE' FLAG
0590 06477 002400 EPR10 CLA EXECUTE COMMA
0591 06500 050567 CPA EOL IF NOT FOLLOWING
0592 06501 015656 JSB EDELM A TAB
0593 06502 003400 EPR11 CCA TURN OFF
0594 06503 070567 STA EOL 'END-OF-LINE' FLAG
0595 06504 160157 LDA TEMPS,I EXTRACT
0596 06505 010425 AND OPDMK OPERAND
0597 06506 002002 SZA NULL?
0598 06507 026527 JMP EPR13 NO, FORMULA OR TAB
0599 06510 034157 EPR12 ISZ TEMPS YES
0600 06511 064157 LDB TEMPS MORE
0601 06512 054143 CPB PRADD STATEMENT?
0602 06513 026565 JMP EPR17 NO

```

|      |       |        |                 |                                |
|------|-------|--------|-----------------|--------------------------------|
| 0603 | 06514 | 160157 | LDA TEMPS,I     | YES, EXTRACT                   |
| 0604 | 06515 | 010420 | AND OPMSK       | NEXT OPERATOR                  |
| 0605 | 06516 | 050403 | CPA B2000       | ',' ?                          |
| 0606 | 06517 | 026477 | JMP EPRI0       | YES                            |
| 0607 | 06520 | 050404 | CPA B3000       | NO, ',' ?                      |
| 0608 | 06521 | 026502 | JMP EPRI1       | YES                            |
| 0609 | 06522 | 050402 | CPA B1000       | NO, " ?                        |
| 0610 | 06523 | 026536 | JMP EPRI4       | YES                            |
| 0611 | 06524 | 003400 | CCA             | NO, MUST BE +,-, OR (          |
| 0612 | 06525 | 040157 | ADA TEMPS       | BACKUP TO PRIOR                |
| 0613 | 06526 | 070157 | STA TEMPS       | NULL OPERAND                   |
| 0614 | 06527 | 003400 | EPRI3 CCA       | SET                            |
| 0615 | 06530 | 070567 | STA EOL         | TAB FLAG                       |
| 0616 | 06531 | 114232 | JSB FETCA,I     | EVALUATE                       |
| 0617 | 06532 | 034567 | ISZ EOL         | TAB?                           |
| 0618 | 06533 | 026510 | JMP EPRI2       | YES                            |
| 0619 | 06534 | 015643 | JSB ENOUT       | NO, PRINT NUMBER               |
| 0620 | 06535 | 026510 | JMP EPRI2       |                                |
| 0621 | 06536 | 002400 | EPRI4 CLA       | TURN ON                        |
| 0622 | 06537 | 070567 | STA EOL         | 'END-OF-LINE' FLAG             |
| 0623 | 06540 | 071467 | STA SLWST       | ZERO                           |
| 0624 | 06541 | 071677 | STA OUTLN       | CHARACTER COUNT                |
| 0625 | 06542 | 160001 | EPRI5 LDA 1,I   |                                |
| 0626 | 06543 | 010376 | AND MSK0        | NON-NULL                       |
| 0627 | 06544 | 002003 | SZA,RSS         | LOW CHARACTER?                 |
| 0628 | 06545 | 026556 | JMP EPRI6       | NO                             |
| 0629 | 06546 | 035677 | ISZ OUTLN       | YES, COUNT IT                  |
| 0630 | 06547 | 006004 | INB             |                                |
| 0631 | 06550 | 160001 | LDA 1,I         |                                |
| 0632 | 06551 | 010420 | AND OPMSK       |                                |
| 0633 | 06552 | 050402 | CPA B1000       | " NEXT?                        |
| 0634 | 06553 | 026556 | JMP EPRI6       | YES                            |
| 0635 | 06554 | 035677 | ISZ OUTLN       | NO, COUNT HIGH CHARACTER       |
| 0636 | 06555 | 026542 | JMP EPRI5       |                                |
| 0637 | 06556 | 065677 | EPRI6 LDB OUTLN | WILL                           |
| 0638 | 06557 | 044133 | ADB CCNT        | LINE                           |
| 0639 | 06560 | 044455 | ADB M73         | EXCEED                         |
| 0640 | 06561 | 006021 | SSB,RSS         | 72 CHARACTERS?                 |
| 0641 | 06562 | 015677 | JSB OUTLN       | YES, GET FRESH LINE            |
| 0642 | 06563 | 114223 | JSB OUTSA,I     | OUTPUT STRING                  |
| 0643 | 06564 | 026504 | JMP EPRI1+2     |                                |
| 0644 | 06565 | 034567 | EPRI7 ISZ EOL   | 'END-OF-LINE' ?                |
| 0645 | 06566 | 026603 | JMP EPRI8       | YES                            |
| 0646 | 06567 | 064146 | LDB TYPE        | NO, LOAD COUNT OF              |
| 0647 | 06570 | 007004 | CMB,INB         | CHARACTERS OUTPUTTED           |
| 0648 | 06571 | 060133 | LDA CCNT        | LOAD LINE LENGTH               |
| 0649 | 06572 | 003004 | CMA,INA         | SAVE NEW COUNT OF              |
| 0650 | 06573 | 070146 | STA TYPE        | CHARACTERS OUTPUTTED           |
| 0651 | 06574 | 040001 | ADA 1           | COMPUTE CHARACTERS NOT YET OUT |
| 0652 | 06575 | 004010 | SLB             | CORRECT FOR START ON           |
| 0653 | 06576 | 040431 | ADA M1          | ODD PRINT POSITION             |
| 0654 | 06577 | 064131 | LDB .BUFA       | OUTPUT                         |
| 0655 | 06600 | 002002 | SZA             | NON-EMPTY                      |
| 0656 | 06601 | 114102 | JSB WRITE,I     | BUFFER                         |
| 0657 | 06602 | 026044 | JMP XEC4        |                                |
| 0658 | 06603 | 015677 | EPRI8 JSB OUTLN | PRINT LINE                     |



|      |                     |        |       |             |                          |
|------|---------------------|--------|-------|-------------|--------------------------|
| 0659 | 06604               | 026044 | JMP   | XEC4        |                          |
| 0660 | **                  |        |       |             |                          |
| 0661 | *** TAB TELEPRINTER |        |       |             | **                       |
| 0662 | **                  |        |       |             |                          |
| 0663 | 06605               | 116631 | ETAB  | JSB IENTA,I | SMALL INTEGER?           |
| 0664 | 06606               | 026627 |       | JMP ETAB1   | NO                       |
| 0665 | 06607               | 006400 |       | CLB         | YES, SET                 |
| 0666 | 06610               | 074567 |       | STB EOL     | 'TAB' FLAG TRUE          |
| 0667 | 06611               | 040454 |       | ADA M72     | EXCEED                   |
| 0668 | 06612               | 002021 |       | SSA,RSS     | 72?                      |
| 0669 | 06613               | 026627 |       | JMP ETAB1   | YES                      |
| 0670 | 06614               | 003004 |       | CMA,INA     | NO, COMPUTE              |
| 0671 | 06615               | 040454 |       | ADA M72     | BLANKS?                  |
| 0672 | 06616               | 040133 |       | ADA CCNT    | REQUIRED                 |
| 0673 | 06617               | 002021 |       | SSA,RSS     | ANY?                     |
| 0674 | 06620               | 124264 |       | JMP FR12A,I | NO                       |
| 0675 | 06621               | 071677 |       | STA OUTLN   | YES,                     |
| 0676 | 06622               | 060345 |       | LDA .32     | OUTPUT                   |
| 0677 | 06623               | 015715 |       | JSB OUTCR   | REQUIRED                 |
| 0678 | 06624               | 035677 |       | ISZ OUTLN   | NUMBER                   |
| 0679 | 06625               | 026622 |       | JMP *-3     | OF BLANKS                |
| 0680 | 06626               | 124264 |       | JMP FR12A,I |                          |
| 0681 | 06627               | 015677 | ETAB1 | JSB OUTLN   | OUTPUT THE               |
| 0682 | 06630               | 124264 |       | JMP FR12A,I | LINE                     |
| 0683 | *                   |        |       |             |                          |
| 0684 | 06631               | 011413 | IENTA | DEF .IENT   |                          |
| 0685 | *                   |        |       |             |                          |
| 0686 | ***                 |        |       |             |                          |
| 0687 | ** EXECUTE INPUT    |        |       |             | **                       |
| 0688 | ***                 |        |       |             |                          |
| 0689 | *                   |        |       |             |                          |
| 0690 | 06632               | 002006 | EINP1 | INA,SZA     | END-OF-INPUT?            |
| 0691 | 06633               | 114206 |       | JSB DRQSA,I | YES, CALL FOR MORE       |
| 0692 | 06634               | 014567 | EINP2 | JSB CONST   | CONVERT AND STORE NUMBER |
| 0693 | 06635               | 026632 |       | JMP EINP1   | NOT NUMBER               |
| 0694 | 06636               | 064157 |       | LDB TEMPS   | END-OF-                  |
| 0695 | 06637               | 006004 |       | INB         |                          |
| 0696 | 06640               | 054143 |       | CPB PRADD   | STATEMENT?               |
| 0697 | 06641               | 026652 |       | JMP EINP3   | YES                      |
| 0698 | 06642               | 050334 |       | CPA .10     | NO, INSURE MORE INPUT    |
| 0699 | 06643               | 114206 | EINPT | JSB DRQSA,I | CALL FOR INPUT           |
| 0700 | 06644               | 114233 |       | JSB FORMA,I | COMPUTE VARIABLE ADDRESS |
| 0701 | 06645               | 003400 |       | CCA         | STORE                    |
| 0702 | 06646               | 140142 |       | ADA HSTPT,I | ADDRESS-1                |
| 0703 | 06647               | 034142 |       | ISZ HSTPT   | IN                       |
| 0704 | 06650               | 070135 |       | STA SBPTR   | POINTER                  |
| 0705 | 06651               | 026634 |       | JMP EINP2   |                          |
| 0706 | 06652               | 002400 | EINP3 | CLA         | RESET                    |
| 0707 | 06653               | 070146 |       | STA TYPE    | OUTPUT BUFFER            |
| 0708 | 06654               | 026044 |       | JMP XEC4    |                          |

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0710**
0711*** EXIT FORMULA CN EMPTY STACK **
0712**
0713 06655 105544 DEF FORMX,I
0714*
0715*** ***
0716** EXECUTE RESTORE **
0717*** ***
0718*
0719 06656 064147 ERSTR LDB DSTRT GET FIRST DATA STATEMENT ADDRESS
0720 06657 054431 CPB M1 IMPOSSIBLE ADDRESS?
0721 06660 026044 JMP XEC4 YES, DONE
0722 06661 016074 JSB SETDP NO, SET DATA POINTER
0723 06662 026044 JMP XEC4 DONE
0001**
0002*** FORMULA OPERATOR JUMP TABLE **
0003**
0004 06663 006722 ARCTB DEF ESCMA SUBSCRIPT SEPARATOR
0005 06664 007002 DEF ESTR ASSIGNMENT OPERATOR
0006 06665 007026 DEF EFAD '+'
0007 06666 007031 DEF EFSB '-'
0008 06667 007034 DEF EFMP '*'
0009 06670 007037 DEF EFDV '/'
0010 06671 007042 DEF EPWR '^'
0011 06672 007164 DEF EGTRT '>'
0012 06673 007171 DEF ELST '<'
0013 06674 007215 DEF ENEQL '#'
0014 06675 007176 DEF EEQL '='
0015 06676 007227 DEF EUMIN UNARY '-'
0016 06677 007232 DEF ELBRC '['
0017 06700 100260 DEF FOR1A,I '('
0018 06701 100262 DEF FOR0B,I UNARY '+'
0019 06702 007240 DEF EOR OR
0020 06703 007246 DEF EAND AND
0021 06704 007253 DEF ENOT NOT
0022 06705 007203 DEF EGORE '>='
0023 06706 007210 DEF ELORE '<='
0024**
0025*** EXECUTE A BINARY OPERATOR **
0026**
0027 06707 000000 BINOP NOP SAVE
0028 06710 162707 LDA BINOP,I SUBROUTINE
0029 06711 072717 STA BIN01 CALL
0030 06712 036707 ISZ BINOP SET RETURN ADDRESS
0031 06713 015515 JSB OPCHK SAVE ADDRESS OF
0032 06714 076720 STB BIN02 TOP OPERAND
0033 06715 034142 ISZ HSTPT UNSTACK ADDRESS
0034 06716 015505 JSB STTOP LOAD SECOND OPERAND
0035 06717 000000 BIN01 NOP PERFORM OPERATION
0036 06720 000000 BIN02 NOP ADDRESS OF SECOND OPERAND
0037 06721 126707 JMP BINOP,I

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0039\*\*

0040\*\*\* EXECUTE SUBSCRIPT COMMA \*\*

0041\*\*

|      |       |        |       |     |         |                                 |
|------|-------|--------|-------|-----|---------|---------------------------------|
| 0042 | 06722 | 016771 | ESCMA | JSB | ESBS    | INTEGERIZE COLUMN SUBSCRIPT     |
| 0043 | 06723 | 034141 |       | ISZ | LSTPT   |                                 |
| 0044 | 06724 | 016771 |       | JSB | ESBS    | INTEGERIZE ROW SUBSCRIPT        |
| 0045 | 06725 | 164142 |       | LDB | HSTPT,I | FETCH                           |
| 0046 | 06726 | 044325 |       | ADB | .2      | SUBSCRIPT                       |
| 0047 | 06727 | 160001 |       | LDA | 1,I     | ROUNDS                          |
| 0048 | 06730 | 010376 |       | AND | MSK0    | SAVE                            |
| 0049 | 06731 | 071677 |       | STA | OUTLN   | COLUMN BOUND                    |
| 0050 | 06732 | 160001 |       | LDA | 1,I     | EXTRACT                         |
| 0051 | 06733 | 001727 |       | ALF | ALF     | ROW                             |
| 0052 | 06734 | 010376 |       | AND | MSK0    | BOUND                           |
| 0053 | 06735 | 003004 |       | CMA | INA     | ACTUAL                          |
| 0054 | 06736 | 140141 |       | ADA | LSTPT,I | ROW SUBSCRIPT                   |
| 0055 | 06737 | 002021 |       | SSA | RSS     | LEGAL?                          |
| 0056 | 06740 | 026757 |       | JMP | E6-1    | NO                              |
| 0057 | 06741 | 061677 |       | LDA | OUTLN   | YES                             |
| 0058 | 06742 | 050324 |       | CPA | .1      | COLUMN MATRIX?                  |
| 0059 | 06743 | 026747 |       | JMP | ESCM1   | YES                             |
| 0060 | 06744 | 015236 |       | JSB | MPY     | NO, COMPUTE ADDRESS             |
| 0061 | 06745 | 100141 |       | DEF | LSTPT,I | DISPLACEMENT                    |
| 0062 | 06746 | 002001 |       | RSS |         | DUE TO ROWS                     |
| 0063 | 06747 | 160141 | ESCM1 | LDA | LSTPT,I |                                 |
| 0064 | 06750 | 007400 |       | CCB |         | UNSTACK                         |
| 0065 | 06751 | 044141 |       | ADB | LSTPT   | ROW                             |
| 0066 | 06752 | 074141 |       | STB | LSTPT   | SUBSCRIPT                       |
| 0067 | 06753 | 065677 |       | LDB | OUTLN   | ACTUAL                          |
| 0068 | 06754 | 007004 |       | CMB | INB     | COLUMN                          |
| 0069 | 06755 | 144141 |       | ADB | LSTPT,I | SUBSCRIPT                       |
| 0070 | 06756 | 006021 |       | SSB | RSS     | LEGAL?                          |
| 0071 | 06757 | 014477 |       | JSB | ERROR   | NO                              |
| 0072 | 06760 | 140141 | E6    | ADA | LSTPT,I | YES, ADD IN COLUMN DISPLACEMENT |
| 0073 | 06761 | 001000 |       | ALS |         | DOUBLE DISPLACEMENT             |
| 0074 | 06762 | 164142 |       | LDB | HSTPT,I | COMPUTE                         |
| 0075 | 06763 | 140001 |       | ADA | 1,I     | ACTUAL                          |
| 0076 | 06764 | 170142 |       | STA | HSTPT,I | ADDRESS                         |
| 0077 | 06765 | 064141 |       | LDB | LSTPT   | UNSTACK                         |
| 0078 | 06766 | 044431 |       | ADB | M1      |                                 |
| 0079 | 06767 | 074141 |       | STB | LSTPT   |                                 |
| 0080 | 06770 | 124260 |       | JMP | FOR1A,I |                                 |

0081\*\*

0082\*\*\* INTEGERIZE A SUBSCRIPT \*\*

0083\*\*

|      |       |        |      |     |         |                        |
|------|-------|--------|------|-----|---------|------------------------|
| 0084 | 06771 | 000000 | ESBS | NOP |         |                        |
| 0085 | 06772 | 015515 |      | JSB | OPCHK   | VALIDATE SUBSCRIPT     |
| 0086 | 06773 | 160001 |      | LDA | 1,I     | FETCH                  |
| 0087 | 06774 | 006004 |      | INB |         | SUBSCRIPT              |
| 0088 | 06775 | 164001 |      | LDB | 1,I     |                        |
| 0089 | 06776 | 015353 |      | JSB | SBFIX   | INTEGERIZE             |
| 0090 | 06777 | 174141 |      | STB | LSTPT,I | SAVE IN OPERATOR STACK |
| 0091 | 07000 | 034142 |      | ISZ | HSTPT   | POP OPERAND STACK      |
| 0092 | 07001 | 126771 |      | JMP | ESBS,I  |                        |

0094\*\*

0095\*\*\* EXECUTE STORE \*\*

0096\*\*

|      |       |        |       |     |           |                                 |
|------|-------|--------|-------|-----|-----------|---------------------------------|
| 0097 | 07002 | 064166 | ESTR  | LDB | TEMPS+7   | IS NEXT OPERATOR                |
| 0098 | 07003 | 006002 |       | SZB |           | AN END-OF-FORMULA?              |
| 0099 | 07004 | 124263 |       | JMP | FOR10,I   | NO, DEFER STORE                 |
| 0100 | 07005 | 054165 |       | CPB | TEMPS+6   | YES, FIRST STORE OPERATOR USED? |
| 0101 | 07006 | 027022 |       | JMP | ESTR2     | YES                             |
| 0102 | 07007 | 160142 | ESTR1 | LDA | HSTPT,I   | SET                             |
| 0103 | 07010 | 070170 |       | STA | TEMPS+9   | DESTINATION                     |
| 0104 | 07011 | 060165 |       | LDA | TEMPS+6   | SOURCE ADDRESS IN (A)           |
| 0105 | 07012 | 164000 |       | LDB | 0,I       | TRANSFER HIGH                   |
| 0106 | 07013 | 174170 |       | STB | TEMPS+9,I | PART OF SOURCE                  |
| 0107 | 07014 | 034170 |       | ISZ | TEMPS+9   | UPDATE                          |
| 0108 | 07015 | 002004 |       | INA |           | POINTERS                        |
| 0109 | 07016 | 164000 |       | LDB | 0,I       | TRANSFER LOW                    |
| 0110 | 07017 | 174170 |       | STB | TEMPS+9,I | PART OF SOURCE                  |
| 0111 | 07020 | 034142 |       | ISZ | HSTPT     | POP STACK                       |
| 0112 | 07021 | 124262 |       | JMP | FOR00,I   |                                 |
| 0113 | 07022 | 015515 | ESTR2 | JSB | OPCHK     | SAVE ADDRESS                    |
| 0114 | 07023 | 074165 |       | STB | TEMPS+6   | OF QUANTITY                     |
| 0115 | 07024 | 034142 |       | ISZ | HSTPT     | YES, POP HIGH-CORE              |
| 0116 | 07025 | 027007 |       | JMP | ESTR1     | STACK AND EXECUTE STORE         |

0117\*\*

0118\*\*\* CALL ADD \*\*

0119\*\*

|      |       |        |      |     |         |
|------|-------|--------|------|-----|---------|
| 0120 | 07026 | 016707 | EFAD | JSB | BINOP   |
| 0121 | 07027 | 017343 |      | JSB | .FAD    |
| 0122 | 07030 | 124261 |      | JMP | FOR0A,I |

0123\*\*

0124\*\*\* CALL SUBTRACT \*\*

0125\*\*

|      |       |        |      |     |         |
|------|-------|--------|------|-----|---------|
| 0126 | 07031 | 016707 | EFSS | JSB | BINOP   |
| 0127 | 07032 | 017347 |      | JSB | .FSB    |
| 0128 | 07033 | 124261 |      | JMP | FOR0A,I |

0129\*\*

0130\*\*\* CALL MULTIPLY \*\*

0131\*\*

|      |       |        |      |     |         |
|------|-------|--------|------|-----|---------|
| 0132 | 07034 | 016707 | EFMP | JSB | BINOP   |
| 0133 | 07035 | 017416 |      | JSB | .FMP    |
| 0134 | 07036 | 124261 |      | JMP | FOR0A,I |

0135\*\*

0136\*\*\* CALL DIVIDE \*\*

0137\*\*

|      |       |        |      |     |         |
|------|-------|--------|------|-----|---------|
| 0138 | 07037 | 016707 | EFIV | JSB | BINOP   |
| 0139 | 07040 | 017463 |      | JSB | .FDV    |
| 0140 | 07041 | 124261 |      | JMP | FOR0A,I |

0141\*\*

0142\*\*\* EXECUTE + \*\*

0143\*\*

|      |       |        |      |     |         |       |
|------|-------|--------|------|-----|---------|-------|
| 0144 | 07042 | 164142 | EPWR | LDB | HSTPT,I | LOAD  |
| 0145 | 07043 | 160001 |      | LDA | 1,I     |       |
| 0146 | 07044 | 006004 |      | INB |         | POWER |
| 0147 | 07045 | 164001 |      | LDB | 1,I     |       |
| 0148 | 07046 | 015364 |      | JSB | IFIX    |       |
| 0149 | 07047 | 027052 |      | JMP | ++3     |       |

|      |       |        |       |             |                  |
|------|-------|--------|-------|-------------|------------------|
| 0150 | 07050 | 102301 |       | SOS         | INTEGER?         |
| 0151 | 07051 | 027065 |       | JMP EPWR1   | YES              |
| 0152 | 07052 | 016707 |       | JSB BINOP   | NO               |
| 0153 | 07053 | 027054 |       | JMP RPWR    |                  |
| 0154 | 07054 | 017144 | RPWR  | JSB PCHK    | CHECK ARGUMENTS  |
| 0155 | 07055 | 002020 |       | SSA         | NEGATIVE BASE?   |
| 0156 | 07056 | 014477 |       | JSB ERROR   | YES              |
| 0157 | 07057 |        | BASER | EQU *       |                  |
| 0158 | 07057 | 066717 |       | LDB BIN01   | NO, LOAD BASE    |
| 0159 | 07060 | 114234 |       | JSB .LOGA,I | TAKE NATURAL LOG |
| 0160 | 07061 | 017416 |       | JSB .FMP    | MULTIPLY         |
| 0161 | 07062 | 106720 |       | DEF BIN02,I | BY POWER         |
| 0162 | 07063 | 114235 |       | JSB .EXPA,I | EXPONENTIATE     |
| 0163 | 07064 | 124261 |       | JMP FOR0A,I | RESULT           |
| 0164 | 07065 | 077463 | EPWR1 | STB TT1     | SAVE SIGN        |
| 0165 | 07066 | 006020 |       | SSB         | SAVE             |
| 0166 | 07067 | 007004 |       | CMB,INB     | ABSOLUTE VALUE   |
| 0167 | 07070 | 077552 |       | STB TT2     | OF POWER         |
| 0168 | 07071 | 016707 |       | JSB BINOP   |                  |
| 0169 | 07072 | 027073 |       | JMP IPWR    |                  |
| 0170 | 07073 | 017144 | IPWR  | JSB PCHK    | CHECK ARGUMENTS  |
| 0171 | 07074 | 066717 |       | LDB BIN01   | STORE            |
| 0172 | 07075 | 072717 |       | STA BIN01   |                  |
| 0173 | 07076 | 076720 |       | STB BIN02   | BASE             |
| 0174 | 07077 | 060466 |       | LDA HONE    | INITIALIZE       |
| 0175 | 07100 | 070163 |       | STA TT3     | RESULT           |
| 0176 | 07101 | 060325 |       | LDA .2      | TO               |
| 0177 | 07102 | 070164 |       | STA TT4     | 1.0              |
| 0178 | 07103 | 067552 | IPWR1 | LDB TT2     | DIVIDE POWER     |
| 0179 | 07104 | 004031 |       | SLB,BRS     | BY 2             |
| 0180 | 07105 | 027124 |       | JMP IPWR3   | WAS ODD          |
| 0181 | 07106 | 077552 |       | STB TT2     | WAS EVEN         |
| 0182 | 07107 | 006002 | IPWR2 | SZB         | ZERO?            |
| 0183 | 07110 | 027135 |       | JMP IPWR4   | NO               |
| 0184 | 07111 | 063463 |       | LDA TT1     | YES              |
| 0185 | 07112 | 002020 |       | SSA         | POSITIVE POWER?  |
| 0186 | 07113 | 027117 |       | JMP IPWR5   | NO               |
| 0187 | 07114 | 060163 |       | LDA TT3     | YES,LOAD         |
| 0188 | 07115 | 064164 |       | LDB TT4     | RESULT           |
| 0189 | 07116 | 124261 |       | JMP FOR0A,I |                  |
| 0190 | 07117 | 060466 | IPWR5 | LDA HONE    | LOAD             |
| 0191 | 07120 | 064325 |       | LDB .2      | 1.0              |
| 0192 | 07121 | 017463 |       | JSB .FDV    | DIVIDE BY        |
| 0193 | 07122 | 000163 |       | DEF TT3     | RESULT           |
| 0194 | 07123 | 124261 |       | JMP FOR0A,I |                  |
| 0195 | 07124 | 077552 | IPWR3 | STB TT2     | SAVE POWER       |
| 0196 | 07125 | 062717 |       | LDA BIN01   | LOAD             |
| 0197 | 07126 | 066720 |       | LDB BIN02   | BASE             |
| 0198 | 07127 | 017416 |       | JSB .FMP    | MULTIPLY BY      |
| 0199 | 07130 | 000163 |       | DEF TT3     | RESULT-SO-FAR    |
| 0200 | 07131 | 070163 |       | STA TT3     | SAVE PARTIAL     |
| 0201 | 07132 | 074164 |       | STB TT4     | RESULT           |
| 0202 | 07133 | 067552 |       | LDB TT2     | LOAD POWER       |
| 0203 | 07134 | 027107 |       | JMP IPWR2   |                  |
| 0204 | 07135 | 062717 | IPWR4 | LDA BIN01   | LOAD             |
| 0205 | 07136 | 066720 |       | LDB BIN02   | BASE             |

PAGE 0100 #07 EXECUTE THE PROGRAM

|                                   |       |        |       |             |                     |
|-----------------------------------|-------|--------|-------|-------------|---------------------|
| 0206                              | 07137 | 017416 |       | JSB .FMP    | SQUARE              |
| 0207                              | 07140 | 006717 |       | DEF BIN01   | IT                  |
| 0208                              | 07141 | 072717 |       | STA BIN01   | SAVE                |
| 0209                              | 07142 | 076720 |       | STB BIN02   | RESULT              |
| 0210                              | 07143 | 027103 |       | JMP IPWR1   |                     |
| 0211**                            |       |        |       |             |                     |
| 0212*** INSURE VALID CPERATION ** |       |        |       |             |                     |
| 0213**                            |       |        |       |             |                     |
| 0214                              | 07144 | 000000 | PCFK  | NOP         |                     |
| 0215                              | 07145 | 076717 |       | STB BIN01   | LOAD                |
| 0216                              | 07146 | 166720 |       | LDB BIN02,I | POWER               |
| 0217                              | 07147 | 002002 |       | SZA         | BASE ZERO?          |
| 0218                              | 07150 | 027161 |       | JMP PCHK1   | NO                  |
| 0219                              | 07151 | 006003 |       | SZB,RSS     | YES, POWER ZERO?    |
| 0220                              | 07152 | 014477 |       | JSB ERROR   | YES                 |
| 0221                              | 07153 |        | POWER | EQU *       |                     |
| 0222                              | 07153 | 006021 |       | SSB,RSS     | NO, POWER POSITIVE? |
| 0223                              | 07154 | 027221 |       | JMP FALSE   | YES                 |
| 0224                              | 07155 | 014477 |       | JSB ERROR   | NO                  |
| 0225                              | 07156 | 060422 | ZRTNG | LDA INF     | USE POSITIVE        |
| 0226                              | 07157 | 064432 |       | LDB M2      | INFINITY            |
| 0227                              | 07160 | 124261 |       | JMP FOR0A,I |                     |
| 0228                              | 07161 | 006003 | PCFK1 | SZB,RSS     | POWER ZERO?         |
| 0229                              | 07162 | 027224 |       | JMP TRUE    | YES, RETURN 1.0     |
| 0230                              | 07163 | 127144 |       | JMP PCHK,I  | NO                  |
| 0231**                            |       |        |       |             |                     |
| 0232*** EXECUTE > **              |       |        |       |             |                     |
| 0233**                            |       |        |       |             |                     |
| 0234                              | 07164 | 016707 | EGRT  | JSB BINOP   | COMPUTE OPERAND     |
| 0235                              | 07165 | 017347 |       | JSB .FSB    | DIFFERENCE          |
| 0236                              | 07166 | 002020 |       | SSA         | NEGATIVE?           |
| 0237                              | 07167 | 027221 |       | JMP FALSE   | YES                 |
| 0238                              | 07170 | 027217 |       | JMP ENEQ1   | NO                  |
| 0239**                            |       |        |       |             |                     |
| 0240*** EXECUTE < **              |       |        |       |             |                     |
| 0241**                            |       |        |       |             |                     |
| 0242                              | 07171 | 016707 | ELST  | JSB BINOP   | COMPUTE OPERAND     |
| 0243                              | 07172 | 017347 |       | JSB .FSB    | DIFFERENCE          |
| 0244                              | 07173 | 002020 |       | SSA         | NEGATIVE?           |
| 0245                              | 07174 | 027224 |       | JMP TRUE    | YES                 |
| 0246                              | 07175 | 027221 |       | JMP FALSE   | NO                  |
| 0247**                            |       |        |       |             |                     |
| 0248*** EXECUTE = **              |       |        |       |             |                     |
| 0249**                            |       |        |       |             |                     |
| 0250                              | 07176 | 016707 | EEQL  | JSB BINOP   | COMPUTE OPERAND     |
| 0251                              | 07177 | 017347 |       | JSB .FSB    | DIFFERENCE          |
| 0252                              | 07200 | 002002 | EEQL1 | SZA         | ZERO?               |
| 0253                              | 07201 | 027221 |       | JMP FALSE   | NO                  |
| 0254                              | 07202 | 027224 |       | JMP TRUE    | YES                 |

```

0256**
0257*** EXECUTE >= **
0258**
0259 07203 016707 EGCRC JSB BINOP COMPUTE OPERAND
0260 07204 017347 JSB .FSB DIFFERENCE
0261 07205 002020 SSA POSITIVE?
0262 07206 027221 JMP FALSE NO
0263 07207 027224 JMP TRUE YES
0264**
0265*** EXECUTE <= **
0266**
0267 07210 016707 ELCRC JSB BINOP COMPUTE OPERAND
0268 07211 017347 JSB .FSB DIFFERENCE
0269 07212 002020 SSA NEGATIVE?
0270 07213 027224 JMP TRUE YES
0271 07214 027200 JMP EEQL1 NO
0272**
0273*** EXECUTE # **
0274**
0275 07215 016707 ENEQL JSB BINOP COMPUTE OPERAND
0276 07216 017347 JSB .FSB DIFFERENCE
0277 07217 002002 ENEW1 SZA NON-ZERO?
0278 07220 027224 JMP TRUE YES
0279**
0280*** SET LOGICAL VALUES **
0281**
0282 07221 002400 FALSE CLA LOAD
0283 07222 006400 CLB ZERO
0284 07223 124261 JMP FOR0A,I
0285 07224 060466 TRUE LDA NONE LOAD
0286 07225 064325 LDB .2 ONE
0287 07226 124261 JMP FOR0A,I
0288**
0289*** EXECUTE UNARY - **
0290**
0291 07227 015505 EUMIN JSB STTOP LOAD NUMBER
0292 07230 015423 JSB ARINV NEGATE NUMBER
0293 07231 124261 JMP FOR0A,I
0294**
0295*** EXECUTE LEFT BRACKET **
0296**
0297 07232 034141 ELBRC ISZ LSTPT LOAD SUBSCRIPT COMMA
0298 07233 064405 LDB SCCNT INFORMATION WORD
0299 07234 015467 JSB SLWST STACK IT
0300 07235 015476 JSB BHSTP STACK
0301 07236 015536 JSB RSCHK
0302 07237 027224 JMP TRUE 1
0303**
0304*** EXECUTE OR **
0305**
0306 07240 016707 EOR JSB BINOP VALIDATE
0307 07241 027242 JMP ORS OPERANDS
0308 07242 002002 ORS SZA SECOND OPERAND NON-ZERO?
0309 07243 027224 JMP TRUE YES
0310 07244 162720 ORS1 LDA BIN02,I NO, CHECK SECOND
0311 07245 027217 JMP ENEQ1 OPERAND

```

0312\*\*

0313\*\*\* EXECUTE AND \*\*

0314\*\*

|      |       |        |      |           |                      |
|------|-------|--------|------|-----------|----------------------|
| 0315 | 07246 | 016707 | EAND | JSB BINOP | VALIDATE             |
| 0316 | 07247 | 027250 |      | JMP ANDS  | OPERANDS             |
| 0317 | 07250 | 002003 | ANIS | SZA,RSS   | SECOND OPERAND ZERO? |
| 0318 | 07251 | 027221 |      | JMP FALSE | YES                  |
| 0319 | 07252 | 027244 |      | JMP ORS1  | NO                   |

0320\*\*

0321\*\*\* EXECUTE NOT \*\*

0322\*\*

|      |       |        |      |           |              |
|------|-------|--------|------|-----------|--------------|
| 0323 | 07253 | 015505 | ENCT | JSB STTOP | LOAD OPERAND |
| 0324 | 07254 | 002002 |      | SZA       | ZERO?        |
| 0325 | 07255 | 027221 |      | JMP FALSE | NO           |
| 0326 | 07256 | 027224 |      | JMP TRUE  | YES          |

0327\*\*

0328\*\*\* ADD TWO FLOATING POINT QUANTITIES \*\*

0329\*\*

|      |       |        |        |             |                               |
|------|-------|--------|--------|-------------|-------------------------------|
| 0330 | 07257 | 000000 | ADMPUP | NOP         |                               |
| 0331 | 07260 | 061677 |        | LDA OUTLN   | COMPUTE                       |
| 0332 | 07261 | 003004 | ADMPU1 | CMA,INA     | EXPONENT                      |
| 0333 | 07262 | 040154 |        | ADA EXP     | DIFFERENCE                    |
| 0334 | 07263 | 002021 |        | SSA,RSS     | ARG 1 LARGER?                 |
| 0335 | 07264 | 027302 |        | JMP ADMU2   | YES                           |
| 0336 | 07265 | 062074 |        | LDA A1      | NO,                           |
| 0337 | 07266 | 066105 |        | LDB A2      | SWAP                          |
| 0338 | 07267 | 072105 |        | STA A2      | ARGUMENTS                     |
| 0339 | 07270 | 076074 |        | STB A1      |                               |
| 0340 | 07271 | 062147 |        | LDA C1      |                               |
| 0341 | 07272 | 066163 |        | LDB C2      |                               |
| 0342 | 07273 | 072163 |        | STA C2      |                               |
| 0343 | 07274 | 076147 |        | STB C1      |                               |
| 0344 | 07275 | 060154 |        | LDA EXP     |                               |
| 0345 | 07276 | 065677 |        | LDB OUTLN   |                               |
| 0346 | 07277 | 071677 |        | STA OUTLN   |                               |
| 0347 | 07300 | 074154 |        | STB EXP     |                               |
| 0348 | 07301 | 027261 |        | JMP ADMU1   |                               |
| 0349 | 07302 | 040447 | ADMPU2 | ADA M25     | SHIFT COUNT >=                |
| 0350 | 07303 | 066147 |        | LDB C1      |                               |
| 0351 | 07304 | 002021 |        | SSA,RSS     | 25 ?                          |
| 0352 | 07305 | 027334 |        | JMP ADMU4   | YES, IGNORE SMALLER ARGUMENT  |
| 0353 | 07306 | 003100 |        | CMA,CLE     | NO, COMPUTE                   |
| 0354 | 07307 | 040447 |        | ADA M25     | SHIFT COUNT                   |
| 0355 | 07310 | 071677 |        | STA OUTLN   | AS NEGATIVE                   |
| 0356 | 07311 | 062105 |        | LDA A2      | LOAD SMALLER                  |
| 0357 | 07312 | 066163 |        | LDB C2      | MANTISSA                      |
| 0358 | 07313 | 035677 | ADMPU3 | ISZ OUTLN   | MORE SHIFTS?                  |
| 0359 | 07314 | 027337 |        | JMP ADMU5   | YES                           |
| 0360 | 07315 | 046147 |        | ADB C1      | NO, ADD LOW MANTISSAS         |
| 0361 | 07316 | 103101 |        | CLO         |                               |
| 0362 | 07317 | 005326 |        | RBR,ELB     | SAVE (E) IN B(0)              |
| 0363 | 07320 | 000040 |        | CLE         |                               |
| 0364 | 07321 | 042074 |        | ADA A1      | ADD HIGH MANTISSAS            |
| 0365 | 07322 | 004010 |        | SLB         | OVERFLOW FROM LOWER MANTISSA? |
| 0366 | 07323 | 002004 |        | INA         | YES, ADD IT IN                |
| 0367 | 07324 | 005566 |        | ERB,CLE,ELB | ERASE B(0)                    |



|   |       |        |                   |                                |
|---|-------|--------|-------------------|--------------------------------|
| 0368  | 07325 | 102301 | SOS               | OVERFLOW?                      |
| 0369  | 07326 | 027335 | JMP ADMU4+1       | NO                             |
| 0370  | 07327 | 001500 | ERA               | YES, SHIFT                     |
| 0371  | 07330 | 005500 | ERB               | MANTISSA DOWN AND              |
| 0372  | 07331 | 034154 | ISZ EXP           | CORRECT EXPONENT               |
| 0373  | 07332 | 027335 | JMP ADMU4+1       |                                |
| 0374  | 07333 | 002001 | RSS               |                                |
| 0375  | 07334 | 062074 | ADMU4 LDA A1      | RETRIEVE HIGH MANTISSA         |
| 0376  | 07335 | 015020 | JSB .PACK         | NORMALIZE AND PACK             |
| 0377  | 07336 | 127257 | JMP ADMUP, I      |                                |
| 0378  | 07337 | 000071 | ADMU5 CLE,SLA,ARS | ARITHMETIC                     |
| 0379  | 07340 | 002200 | CME               | DOUBLE                         |
| 0380  | 07341 | 005540 | ERB,CLE           | SHIFT                          |
| 0381  | 07342 | 027313 | JMP ADMU3         |                                |
| 0382**  |       |        |                   |                                |
| 0383*** ADD TWO FLOATING POINT NUMBERS **             |       |        |                   |                                |
| 0384**  |       |        |                   |                                |
| 0385  | 07343 | 000000 | .FAD NOP          |                                |
| 0386  | 07344 | 017366 | JSB UNPAK         | UNPACK THE ARGUMENTS           |
| 0387  | 07345 | 017257 | JSB ADMUP         | ADD THEM UP                    |
| 0388  | 07346 | 127343 | JMP .FAD, I       |                                |
| 0389**  |       |        |                   |                                |
| 0390*** SUBTRACT TWO FLOATING POINT NUMBERS **        |       |        |                   |                                |
| 0391**  |       |        |                   |                                |
| 0392  | 07347 | 000000 | .FSB NOP          |                                |
| 0393  | 07350 | 017366 | JSB UNPAK         | UNPACK THE ARGUMENTS           |
| 0394  | 07351 | 062105 | LDA A2            | TWO'S COMPLEMENT               |
| 0395  | 07352 | 003000 | CMA               | THE SECOND ARGUMENT            |
| 0396  | 07353 | 007006 | CMB,INB,8ZB       | LOW PART ZERO?                 |
| 0397  | 07354 | 027362 | JMP .FSB1         | NO                             |
| 0398  | 07355 | 002025 | SSA,INA,RSS       | YES, ORIGINAL NUMBER NEGATIVE? |
| 0399  | 07356 | 002021 | SSA,RSS           | YES, STILL NEGATIVE?           |
| 0400  | 07357 | 027362 | JMP .FSB1         | NO                             |
| 0401  | 07360 | 001300 | RAR               | YES, SHIFT DOWN AND            |
| 0402  | 07361 | 035677 | ISZ OUTLN         | CORRECT EXPONENT               |
| 0403  | 07362 | 076163 | .FSB1 STB C2      | SAVE COMPLEMENTED              |
| 0404  | 07363 | 072105 | STA A2            | NUMBER                         |
| 0405  | 07364 | 017257 | JSB ADMUP         | ADD ARGUMENTS                  |
| 0406  | 07365 | 127347 | JMP .FSB, I       |                                |
| 0407**  |       |        |                   |                                |
| 0408*** UNPACK ARGUMENTS FOR ARITHMETIC OPERATIONS ** |       |        |                   |                                |
| 0409**  |       |        |                   |                                |
| 0410  | 07366 | 000000 | UNPAK NOP         |                                |
| 0411  | 07367 | 072074 | STA A1            | SAVE HIGH PART OF ARG 1        |
| 0412  | 07370 | 002003 | 8ZA,RSS           | UNPACK                         |
| 0413  | 07371 | 006404 | CLB,INB           | SECOND                         |
| 0414  | 07372 | 015456 | JSB .FLUN         | WORD                           |
| 0415  | 07373 | 076147 | STB C1            | SAVE LOW PART OF ARG 1         |
| 0416  | 07374 | 070154 | STA EXP           | SAVE EXPONENT OF ARG 1         |
| 0417  | 07375 | 063366 | LDA UNPAK         | COMPUTE ADDRESS OF             |
| 0418  | 07376 | 040432 | ADA M2            | CALLING ROUTINE                |
| 0419  | 07377 | 164000 | LDB 0, I          |                                |
| 0420  | 07400 | 134000 | ISZ 0, I          | SET CALLING ROUTINE'S RETURN   |
| 0421  | 07401 | 164001 | LDB 1, I          | LOAD                           |
| 0422  | 07402 | 005275 | RBL,CLE,SLB,ERB   | ADDRESS OF                     |
| 0423  | 07403 | 027401 | JMP *-2           | ARG 2                          |

|  |       |        |             |                            |
|--|-------|--------|-------------|----------------------------|
| 0424   | 07404 | 160001 | LDA 1,I     | LOAD                       |
| 0425   | 07405 | 006004 | INB         | ARG 2                      |
| 0426   | 07406 | 164001 | LDB 1,I     |                            |
| 0427   | 07407 | 072105 | STA A2      | SAVE HIGH PART OF ARG 2    |
| 0428   | 07410 | 002003 | SZA,RSS     | UNPACK                     |
| 0429   | 07411 | 006404 | CLB,INB     | SECOND                     |
| 0430   | 07412 | 015456 | JSB .FLUN   | WORD                       |
| 0431   | 07413 | 076163 | STB C2      | SAVE LOW PART OF ARG 2     |
| 0432   | 07414 | 071677 | STA OUTLN   | SAVE EXPONENT OF ARG 2     |
| 0433   | 07415 | 127366 | JMP UNPAK,I |                            |
| 0434**   |       |        |             |                            |
| 0435*** MULTIPLY TWO FLOATING POINT NUMBERS ** |       |        |             |                            |
| 0436**   |       |        |             |                            |
| 0437   | 07416 | 000000 | .FMP NOP    | UNPACK THE                 |
| 0438   | 07417 | 017366 | JSB UNPAK   | ARGUMENTS                  |
| 0439   | 07420 | 040154 | ADA EXP     | ADD EXPONENTS              |
| 0440   | 07421 | 002004 | INA         | PLUS 1 FOR                 |
| 0441   | 07422 | 070154 | STA EXP     | NORMALIZATION              |
| 0442   | 07423 | 005300 | RBR         | POSITION LOW PART OF ARG 2 |
| 0443   | 07424 | 060001 | LDA 1       | COMPUTE A                  |
| 0444   | 07425 | 015236 | JSB MPY     | CROSS PRODUCT              |
| 0445   | 07426 | 006074 | DEF A1      |                            |
| 0446   | 07427 | 072163 | STA C2      | SAVE RESULT                |
| 0447   | 07430 | 062147 | LDA C1      | LOAD AND POSITION          |
| 0448   | 07431 | 001300 | RAR         | LOW PART OF ARG 1          |
| 0449   | 07432 | 076147 | STB C1      | SAVE REST OF PRIOR RESULT  |
| 0450   | 07433 | 015236 | JSB MPY     | COMPUTE SECOND             |
| 0451   | 07434 | 006105 | DEF A2      | CROSS PRODUCT              |
| 0452   | 07435 | 046147 | ADB C1      | ADD                        |
| 0453   | 07436 | 000040 | CLE         | CROSS                      |
| 0454   | 07437 | 042163 | ADA C2      | PRODUCTS                   |
| 0455   | 07440 | 002040 | SEZ         | CORRECT                    |
| 0456   | 07441 | 006004 | INB         | FOR CARRY                  |
| 0457   | 07442 | 076163 | STB C2      | SAVE RESULT                |
| 0458   | 07443 | 062074 | LDA A1      | COMPUTE                    |
| 0459   | 07444 | 015236 | JSB MPY     | HIGH PART                  |
| 0460   | 07445 | 006105 | DEF A2      | OF PRODUCT                 |
| 0461   | 07446 | 000065 | CLE,ERA     | POSITION LOW PART          |
| 0462   | 07447 | 042163 | ADA C2      | ADD IN CROSS TERMS         |
| 0463   | 07450 | 000066 | CLE,ELA     | REPOSITION                 |
| 0464   | 07451 | 002041 | SEZ,RSS     | CARRY FROM LOW PART?       |
| 0465   | 07452 | 027456 | JMP **4     | NO                         |
| 0466   | 07453 | 102201 | SOC         | YES, POSITIVE CARRY?       |
| 0467   | 07454 | 006005 | INB,RSS     | YES                        |
| 0468   | 07455 | 044431 | ADB M1      | NO                         |
| 0469   | 07456 | 072074 | STA A1      | EXCHANGE                   |
| 0470   | 07457 | 060001 | LDA 1       |                            |
| 0471   | 07460 | 066074 | LDB A1      | REGISTERS                  |
| 0472   | 07461 | 015020 | JSB .PACK   | NORMALIZE AND PACK         |
| 0473   | 07462 | 127416 | JMP .FMP,I  |                            |

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0475**
0476***  PERFORM FLOATING DIVIDE  **
0477**
0478 07463 000000 .FLV NOP
0479 07464 017366 JSB UNPAK UNPACK ARGUMENTS
0480 07465 066105 LDB A2 DIVISOR
0481 07466 006003 SZB,RSS ZERO?
0482 07467 027546 JMP .FDV2 YES
0483 07470 066074 LDB A1 NO, DIVIDEND
0484 07471 006003 SZB,RSS ZERO?
0485 07472 027543 JMP .FDV1 YES
0486 07473 003004 CMA,INA NO, COMPUTE
0487 07474 002004 INA EXPONENT
0488 07475 040154 ADA EXP DIFFERENCE
0489 07476 070154 STA EXP PLUS 1
0490 07477 062147 LDA C1 LOAD DIVIDEND
0491 07500 004071 CLE,SLB,BRS ARITHMETIC
0492 07501 002200 CME RIGHT SHIFT
0493 07502 001500 ERA TWICE TO
0494 07503 004071 CLE,SLB,BRS PREVENT
0495 07504 002200 CME DIVISION
0496 07505 001500 ERA OVERFLOW
0497 07506 017552 JSB IDIV DIVIDE
0498 07507 071677 STA OUTLN SAVE QUOTIENT
0499 07510 005100 BRS
0500 07511 002400 CLA DIVIDE REMAINDER BY 2 TO
0501 07512 017552 JSB IDIV PREVENT DIVISION OVERFLOW
0502 07513 070615 STA NUMCK DIVIDE REMAINDER AND
0503 07514 066163 LDB C2 SAVE LOW PART OF QUOTIENT
0504 07515 002500 CLA,CLE
0505 07516 005521 ERB,BRS SCALE TO
0506 07517 005100 BRS PREVENT
0507 07520 017552 JSB IDIV OVERFLOW
0508 07521 003004 CMA,INA COMPUTE B2/A2 = 0
0509 07522 015236 JSB MPY COMPUTE
0510 07523 001677 DEF OUTLN -HIGH QUOTIENT*Q
0511 07524 005066 BLS,CLE,ELB SHIFT SIGN TO (E)
0512 07525 060615 LDA NUMCK LOW QUOTIENT
0513 07526 002020 SSA NEGATIVE?
0514 07527 003401 CCA,RSS YES, SET (A)=-1 (EXTEND
0515 07530 002400 CLA NO, SET (A)=0 SIGN)
0516 07531 003040 CMA,SEZ IF (E)=1 SUBTRACT
0517 07532 002004 INA 1 AS EXTENSION
0518 07533 003100 CMA,CLE OF PRODUCT
0519 07534 044615 ADB NUMCK ADD IN LOW QUOTIENT
0520 07535 002040 SEZ CARRY
0521 07536 002004 INA INTO (A)
0522 07537 004066 CLE,ELB POSITION
0523 07540 001600 ELA REGISTERS
0524 07541 041677 ADA OUTLN ADD IN HIGH QUOTIENT
0525 07542 002001 RSS
0526 07543 002400 .FLV1 CLA SET MANTISSA TO ZERO
0527 07544 015020 JSB .PACK NORMALIZE AND PACK
0528 07545 127463 JMP .FDV,1
0529 07546 014477 .FLV2 JSB ERROR DIVIDE-BY-ZERO
0530 07547 062074 DBYZR LDA A1

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|      |                       |        |       |             |                         |
|------|-----------------------|--------|-------|-------------|-------------------------|
| 0531 | 07550                 | 015103 |       | JSB OVFLW   | RETURN INFINITY         |
| 0532 | 07551                 | 127463 |       | JMP .FDV,I  |                         |
| 0533 | **                    |        |       |             |                         |
| 0534 | *** INTEGER DIVIDE ** |        |       |             |                         |
| 0535 | **                    |        |       |             |                         |
| 0536 | 07552                 | 000000 | IDIV  | NOP         | DIVIDEND IN (B) AND (A) |
| 0537 | 07553                 | 076074 |       | STB A1      | SAVE HIGH DIVIDEND      |
| 0538 | 07554                 | 066105 |       | LDB A2      |                         |
| 0539 | 07555                 | 006120 |       | CLE,SSB     | SET (B) TO ABS(B)       |
| 0540 | 07556                 | 007204 |       | CMB,CME,INB | AND (E) TO SIGN(B)      |
| 0541 | 07557                 | 077343 |       | STB .FAD    | SAVE POSITIVE DIVISOR   |
| 0542 | 07560                 | 007004 |       | CMB,INB     | SAVE                    |
| 0543 | 07561                 | 077347 |       | STB .FSB    | NEGATIVE DIVISOR        |
| 0544 | 07562                 | 064445 |       | LDB M16     | SET                     |
| 0545 | 07563                 | 076147 |       | STB C1      | COUNTER                 |
| 0546 | 07564                 | 064432 |       | LDB M2      | SET                     |
| 0547 | 07565                 | 074153 |       | STB SIGN    | SIGNS                   |
| 0548 | 07566                 | 077416 |       | STB .FMP    |                         |
| 0549 | 07567                 | 066074 |       | LDB A1      | RETRIEVE HIGH DIVIDEND  |
| 0550 | 07570                 | 006021 |       | SSB,RSS     | POSITIVE?               |
| 0551 | 07571                 | 027577 |       | JMP IDIV1   | YES                     |
| 0552 | 07572                 | 037416 |       | ISZ .FMP    | NO, SET REMAINDER SIGN  |
| 0553 | 07573                 | 007200 |       | CMB,CME     | NEGATIVE AND COMPLEMENT |
| 0554 | 07574                 | 002002 |       | SZA         | THE DIVISOR             |
| 0555 | 07575                 | 003005 |       | CMA,INA,RSS | AND (E)                 |
| 0556 | 07576                 | 006004 |       | INB         |                         |
| 0557 | 07577                 | 002040 | IDIV1 | SEZ         | QUOTIENT POSITIVE?      |
| 0558 | 07600                 | 034153 |       | ISZ SIGN    | NO                      |
| 0559 | 07601                 | 000066 | IDIV2 | CLE,ELA     | SHIFT                   |
| 0560 | 07602                 | 005600 |       | ELB         | DIVIDEND                |
| 0561 | 07603                 | 047347 |       | ADB .FSB    | SUBTRACT DIVISOR        |
| 0562 | 07604                 | 006021 |       | SSB,RSS     | OK?                     |
| 0563 | 07605                 | 002005 |       | INA,RSS     | YES                     |
| 0564 | 07606                 | 047343 |       | ADB .FAD    | NO, RESTORE DIVIDEND    |
| 0565 | 07607                 | 036147 |       | ISZ C1      | DONE?                   |
| 0566 | 07610                 | 027601 |       | JMP IDIV2   | NO                      |
| 0567 | 07611                 | 003004 |       | CMA,INA     | YES, NEGATE QUOTIENT    |
| 0568 | 07612                 | 034153 |       | ISZ SIGN    | RESULT TO BE POSITIVE?  |
| 0569 | 07613                 | 003004 |       | CMA,INA     | YES                     |
| 0570 | 07614                 | 037416 |       | ISZ .FMP    | NO, REMAINDER POSITIVE? |
| 0571 | 07615                 | 127552 |       | JMP IDIV,I  | YES                     |
| 0572 | 07616                 | 007004 |       | CMB,INB     | NO                      |
| 0573 | 07617                 | 127552 |       | JMP IDIV,I  |                         |

```

0575*          *****
0576*          SYMBOL TABLE SEARCH SUBROUTINE
0577*          *****
0578*
0579*          THE SUBROUTINE IS CALLED WITH THE IDENTIFIER TO BE
0580*          SEARCHED FOR IN A . THE SUBROUTINE RETURNS WITH
0581*          THE ADDRESS OF THE MATCHING ENTRY IN B OR -1 IN
0582*          B IF THERE IS NO MATCHING ENTRY
0583*          THE FOLLOWING RULES APPLY WHEN SEARCHING FOR ARRAYS
0584*
0585*          TYPE 1 (1 DIMENSION) SEARCH FOR CORRESPONDING TYPE 1
0586*          OR TYPE 3 ARRAY. IF TYPE 3 IS FOUND CHANGE THE ENTRY
0587*          TYPE TO TYPE 1
0588*
0589*          TYPE 2 (2 DIMENSIONS) SEARCH FOR CORRESPONDING TYPES
0590*          OR TYPE 3 ARRAY. IF TYPE 3 IS FORND CHANGE THE ENTRY
0591*          TYPE TO TYPE 2
0592*
0593*          TYPE 3 (UNDIMENSIONED) SEARCH FOR CORRESPONDING
0594*          TYPE 3 OR TYPE 1 OR TYPE 2 ARRAY
0595*
0596 07620 000000 SSYMT NOP
0597 07621 070163 STA STMP      STORE IDENTIFIER
0598 07622 010336 AND .15      ISOLATE IDENTIFIER TYPE
0599 07623 040434 ADA M4
0600 07624 002024 SSA,INA
0601 07625 027631 JMP **4      JUMP IF ARRAY TYPE
0602 07626 060163 LDA STMP      RESTORE A
0603 07627 070001 STA 1        STORE IN B
0604 07630 027643 JMP SYMT1+3
0605 07631 002020 SSA          SKIP IF UNDIMENSIONED
0606 07632 027640 JMP SYMT1
0607 07633 060163 LDA STMP      RESTORE A
0608 07634 010437 AND MSK3     1777718 SET TYPE TO 1
0609 07635 070001 STA 1
0610 07636 006004 INB          SET TYPE IN B TO 2
0611 07637 027643 JMP **4
0612 07640 007400 SYMT1 CCB      SET DIMENSIONED FLAG IN B
0613 07641 060326 LDA .3
0614 07642 030163 IOR STMP      SET TYPE TO UNDEFINED
0615 07643 070164 STA STMP+1    STORE A
0616 07644 074165 STB STMP+2    STORE B
0617 07645 064116 LDB SYMTF     START OF SYMBOL TABLE
0618 07646 027667 JMP SYMT4
0619 07647 160001 SYMT2 LDA 1,1    PICK UP 1ST WORD OF ENTRY
0620 07650 050163 CPA STMP      COMPARE WITH IDENTIFIER
0621 07651 127620 JMP SSYMT,1    MATCH ? RETURN
0622 07652 050164 CPA STMP+1    COMPARE WITH DIFFERENT DIM.
0623 07653 027674 JMP SYMT3
0624 07654 050165 CPA STMP+2    COMPARE WITH DIFFERENT DIM.
0625 07655 027674 JMP SYMT3
0626 07656 160001 LDA 1,1
0627 07657 010336 AND .15      ISOLATE ENTRY TYPE
0628 07660 050336 CPA .15      FUNCTION ?
0629 07661 027666 JMP **5      YES
0630 07662 040434 ADA M4

```

|      |       |        |                 |                                 |
|------|-------|--------|-----------------|---------------------------------|
| 0631 | 07663 | 002020 | SSA             | ARRAY ?                         |
| 0632 | 07664 | 006004 | INB             | YES INCREMENT POINTER           |
| 0633 | 07665 | 006004 | INB             | INCREMENT POINTER               |
| 0634 | 07666 | 044325 | ADB .2          | ADD 2 TO POINTER                |
| 0635 | 07667 | 054117 | SYMT4 CPB SYMTA | SYMBOL TABLE EXHAUSTED?         |
| 0636 | 07670 | 007401 | CCB,RSS         | YES                             |
| 0637 | 07671 | 027647 | JMP SYMT2       | NO, CHECK NEXT ENTRY FOR MATCH  |
| 0638 | 07672 | 060163 | LDA STEMF       | RETRIEVE SYMBOL                 |
| 0639 | 07673 | 127620 | JMP SSYM1,1     | RETURN WITH 0 NEGATIVE          |
| 0640 | 07674 | 060163 | SYMT3 LDA STEMF | RESTORE A                       |
| 0641 | 07675 | 034165 | ISZ STEMF+2     | DIMENSIONED IDENTIFIER?         |
| 0642 | 07676 | 002001 | RSS             | NO, SKIP                        |
| 0643 | 07677 | 170001 | STA 1,1         | YES CHANGE 1ST WORD OF ENTRY TO |
| 0644 | 07700 | 127620 | JMP SSYM1,1     | APPROPRIATE DIMENSION TYPE      |

0002\*\*

0003\*\*\* ERROR TABLE \*\*

0004\*\*

|      |       | ERR    |             |                                  |
|------|-------|--------|-------------|----------------------------------|
| 0005 | 07701 | 000266 | DEF EOF+1   | PREMATURE STATEMENT END          |
| 0006 | 07702 | 002066 | DEF RTLE    | INPUT EXCEEDS 71 CHARACTERS      |
| 0007 | 07703 | 002137 | DEF INVSC   | SYSTEM COMMAND NOT RECOGNIZED    |
| 0008 | 07704 | 002236 | DEF SYNE1   | NO STATEMENT TYPE FOUND          |
| 0009 | 07705 | 000717 | DEF NUMER+1 | BAD EXPONENT PART                |
| 0010 | 07706 | 002656 | DEF SYE16   | NO LETTER WHERE EXPECTED         |
| 0011 | 07707 | 002346 | DEF SYNE2   | LET STATEMENT HAS NO STORE       |
| 0012 | 07710 | 002361 | DEF SYNE3   | ILLEGAL COM STATEMENT            |
| 0013 | 07711 | 002406 | DEF SYNE4+1 | NO FUNCTION IDENTIFIER (OR BAD)  |
| 0014 | 07712 | 002420 | DEF SYNE5   | MISSING PARAMETER                |
| 0015 | 07713 | 002425 | DEF SYNE6+1 | MISSING ASSIGNMENT OPERATOR      |
| 0016 | 07714 | 002445 | DEF SYNE7   | MISSING 'THEN'                   |
| 0017 | 07715 | 002453 | DEF SYNE8+1 | MISSING OR IMPROPER FOR-VARIABLE |
| 0018 | 07716 | 002465 | DEF SYNE9   | MISSING 'TO'                     |
| 0019 | 07717 | 002500 | DEF SYE10   | BAD 'STEP' PART IN FOR STATEMENT |
| 0020 | 07720 | 001330 | DEF CALER   | CALLED ROUTINE DOES NOT EXIST    |
| 0021 | 07721 | 002541 | DEF SYE11+1 | WRONG NUMBER OF CALL PARAMETERS  |
| 0022 | 07722 | 000614 | DEF SYE12   | NO CONSTANT WHERE EXPECTED       |
| 0023 | 07723 | 002561 | DEF SYE13   | NO VARIABLE WHERE EXPECTED       |
| 0024 | 07724 | 002613 | DEF SYE14   | NO CLOSING QUOTE FOR STRING      |
| 0025 | 07725 | 002625 | DEF SYE15   | PRINT JUXTAPOSES FORMULAS        |
| 0026 | 07726 | 002671 | DEF SYE17   | IMPROPER WORD IN MAT STATEMENT   |
| 0027 | 07727 | 002702 | DEF SYE18   | NO COMMA WHERE EXPECTED          |
| 0028 | 07730 | 002755 | DEF SYE19   | IMPROPER ARRAY FUNCTION          |
| 0029 | 07731 | 002775 | DEF SYE20   | NO SUBSCRIPT WHERE EXPECTED      |
| 0030 | 07732 | 003007 | DEF SYE21   | ARRAY INVERSION INTO SELF        |
| 0031 | 07733 | 003020 | DEF SYE22   | MISSING MULTIPLICATION OPERATOR  |
| 0032 | 07734 | 003041 | DEF SYE23   | IMPROPER ARRAY OPERATOR          |
| 0033 | 07735 | 003060 | DEF SYE24+1 | ARRAY MULTIPLICATION INTO SELF   |
| 0034 | 07736 | 003202 | DEF FSCE1+1 | MISSING LEFT PARENTHESIS         |
| 0035 | 07737 | 003256 | DEF FSCE2+1 | MISSING RIGHT PARENTHESIS        |
| 0036 | 07740 | 003306 | DEF FSCE3+1 | UNRECOGNIZED OPERAND             |
| 0037 | 07741 | 003534 | DEF ARRE1   | MISSING SUBSCRIPT                |
| 0038 | 07742 | 003547 | DEF ARRE2   | MISSING ARRAY IDENTIFIER         |

|       |       |        |       |                |                                 |
|-------|-------|--------|-------|----------------|---------------------------------|
| 0039  | 07743 | 004345 | DEF   | SYE25+1        | MISSING OR BAD INTEGER          |
| 0040  | 07744 | 000267 | DEF   | NOEOF+1        | CHARACTERS AFTER STATEMENT END  |
| 0041  | 07745 | 003402 | DEF   | FSCE4+1        | OUT OF CORE DURING SYNTAX       |
| 0042  | 07746 | 002170 | DEF   | PRERR          | PHOTO READER NOT READY          |
| 0043  | 07747 | 005312 | DEF   | MER4           | FUNCTION MULTIPLY DEFINED       |
| 0044  | 07750 | 005413 | DEF   | MER6           | UNMATCHED FOR STATEMENT         |
| 0045  | 07751 | 005264 | DEF   | MER3           | UNMATCHED NEXT                  |
| 0046  | 07752 | 005512 | DEF   | MER8           | OUT OF STORAGE-SYMBOL TABLE     |
| 0047  | 07753 | 005541 | DEF   | M3YM           | INCONSISTENT DIMENSIONS         |
| 0048  | 07754 | 005301 | DEF   | MLOP6          | LAST STATEMENT IS NOT 'END'     |
| 0049  | 07755 | 005377 | DEF   | MER5           | ARRAY DOUBLE DIMENSIONED        |
| 0050  | 07756 | 005431 | DEF   | MER10          | NO OF DIMENSIONS UNSPECIFIED    |
| 0051  | 07757 | 001352 | DEF   | MER9           | ARRAY TOO LARGE                 |
| 0052  | 07760 | 005464 | DEF   | MER7           | OUT OF STORAGE-ARRAY ALLOCATION |
| 0053  | 07761 | 006760 | DEF   | E6             | SUBSCRIPT TOO LARGE             |
| 0054  | 07762 | 001526 | DEF   | E8             | UNDEFINED OPERAND ACCESSED      |
| 0055  | 07763 | 007057 | DEF   | BASER          | NEGATIVE BASE POWERED TO REAL   |
| 0056  | 07764 | 007153 | DEF   | POWER          | ZERO TO ZERO POWER              |
| 0057  | 07765 | 006054 | DEF   | XEC5           | MISSING STATEMENT               |
| 0058  | 07766 | 006363 | DEF   | E2             | GOSUBS NESTED 10 DEEP           |
| 0059  | 07767 | 006367 | DEF   | E3             | RETURN FINDS NO ADDRESS         |
| 0060  | 07770 | 006135 | DEF   | E4             | OUT OF DATA                     |
| 0061  | 07771 | 001474 | DEF   | E1+1           | OUT OF STORAGE - EXECUTION      |
| 0062  | 07772 | 011766 | DEF   | E7             | RE-DIMENSIONED ARRAY TOO LARGE  |
| 0063  | 07773 | 012036 | DEF   | LERR+1         | DIMENSIONS NOT COMPATIBLE       |
| 0064  | 07774 | 012100 | DEF   | LCHK5          | MATRIX UNASSIGNED               |
| 0065  | 07775 | 012704 | DEF   | LDUM1          | NEARLY SINGULAR MATRIX          |
| 0066  | 07776 | 010420 | DEF   | TRGR           | ARGUMENT TOO LARGE              |
| 0067  | 07777 | 010771 | DEF   | SQRER          | SQRT HAS NEGATIVE ARGUMENT      |
| 0068  | 10000 | 011077 | DEF   | LOGER          | LOG OF NEGATIVE ARGUMENT        |
| 0069  | 10001 |        | RCERK | EQU *          | ** RECOVERABLE ERRORS FOLLOW ** |
| 0070  | 10001 | 001100 | DEF   | OVRR           | OVERFLOW                        |
| 0071  | 10002 | 001074 | DEF   | UNDER          | UNDERFLOW                       |
| 0072  | 10003 | 011151 | DEF   | LNZR           | LOG OF ZERO                     |
| 0073  | 10004 | 011305 | DEF   | EXPER          | EXPONENTIAL OVERFLOW            |
| 0074  | 10005 | 007547 | DEF   | DBYZR          | DIVIDE BY ZERO                  |
| 0075  | 10006 | 007156 | DEF   | ZRTNG          | ZERO TO NEGATIVE POWER          |
| 0076* |       |        |       |                |                                 |
| 0077* |       |        |       |                |                                 |
| 0078  | 10007 | 006412 | EBLFF | OCT 6412       |                                 |
| 0079  | 10010 | 042522 |       | ASC 3,ERROR    |                                 |
| 0080  | 10013 | 000000 | EBFF  | BSS 2          |                                 |
| 0081  | 10015 | 020111 | LBUFF | ASC 5, IN LINE |                                 |
| 0082  | 10022 | 000000 | LNBFF | BSS 2          |                                 |

0084\*\*

0085\*\*\* PREDEFINED FUNCTION JUMP TABLE \*\*

0086\*\*

|      |       |        |      |     |      |
|------|-------|--------|------|-----|------|
| 0087 | 10024 | 006605 | PDFT | DEF | ETAB |
| 0088 | 10025 | 010647 |      | DEF | ESIN |
| 0089 | 10026 | 010645 |      | DEF | ECOS |
| 0090 | 10027 | 010406 |      | DEF | ETAN |
| 0091 | 10030 | 010532 |      | DEF | EATN |
| 0092 | 10031 | 011177 |      | DEF | EEXP |
| 0093 | 10032 | 011070 |      | DEF | ELOG |
| 0094 | 10033 | 010642 |      | DEF | EABS |
| 0095 | 10034 | 010765 |      | DEF | ESQR |
| 0096 | 10035 | 011055 |      | DEF | EINT |
| 0097 | 10036 | 010736 |      | DEF | ERNR |
| 0098 | 10037 | 011166 |      | DEF | ESGN |

0099\*\*

0100\*\*\* OUTPUT A NUMBER \*\*

0101\*\*

|      |       |        |       |             |                       |
|------|-------|--------|-------|-------------|-----------------------|
| 0102 | 10040 | 000000 | NUMOT | NOP         | NUMBER IN (A) AND (B) |
| 0103 | 10041 | 071603 |       | STA EXPON   | SAVE NUMBER           |
| 0104 | 10042 | 002041 |       | SEZ,RSS     | SIGN?                 |
| 0105 | 10043 | 026055 |       | JMP NS2     | NO                    |
| 0106 | 10044 | 002021 |       | SSA,RSS     | YES, NEGATIVE NUMBER? |
| 0107 | 10045 | 026052 |       | JMP NS1     | NO                    |
| 0108 | 10046 | 015423 |       | JSB ARINV   | YES, INVERT IT        |
| 0109 | 10047 | 071603 |       | STA EXPON   |                       |
| 0110 | 10050 | 060354 |       | LDA .45     |                       |
| 0111 | 10051 | 002001 |       | RSS         |                       |
| 0112 | 10052 | 060345 | NS1   | LDA .32     | STORE                 |
| 0113 | 10053 | 070153 |       | STA SIGN    | SIGN                  |
| 0114 | 10054 | 061603 |       | LDA EXPON   |                       |
| 0115 | 10055 | 076344 | NS2   | STB GETDG   | SAVE NUMBER           |
| 0116 | 10056 | 015364 |       | JSB IFIX    | INTEGERIZE            |
| 0117 | 10057 | 000000 |       | NOP         |                       |
| 0118 | 10060 | 162040 |       | LDA NUMOT,I | SET                   |
| 0119 | 10061 | 072101 |       | STA NUM01   | END-OF-LINE           |
| 0120 | 10062 | 072135 |       | STA NUM03   | OPERATION             |
| 0121 | 10063 | 036040 |       | ISZ NUMOT   | BUMP RETURN ADDRESS   |
| 0122 | 10064 | 102201 |       | SOC         | WAS IT AN INTEGER?    |
| 0123 | 10065 | 026110 |       | JMP NUM02   | NO                    |

0124\*\*

0125\*\*\* OUTPUT AN INTEGER \*\*

0126\*\*

|      |       |        |       |             |                |
|------|-------|--------|-------|-------------|----------------|
| 0127 | 10066 | 002400 |       | CLA         | SAVE           |
| 0128 | 10067 | 074174 |       | STB B1+1    | INTEGER        |
| 0129 | 10070 | 044462 |       | ADB M1000   | 5 OR MORE      |
| 0130 | 10071 | 006021 |       | SSB,RSS     | CHARACTERS?    |
| 0131 | 10072 | 040326 |       | ADA .3      | YES            |
| 0132 | 10073 | 040330 |       | ADA .6      | COMPUTE        |
| 0133 | 10074 | 040133 |       | ADA CCNT    | END-OF-FIELD   |
| 0134 | 10075 | 003004 |       | CMA,INA     | SAVE MARKER TO |
| 0135 | 10076 | 070172 |       | STA MLBX1+1 | END-OF-FIELD   |
| 0136 | 10077 | 040367 |       | ADA .74     | ENOUGH         |
| 0137 | 10100 | 002020 |       | SSA         | ROOM?          |
| 0138 | 10101 | 000000 | NUM01 | NOP         | NO             |
| 0139 | 10102 | 060153 |       | LDA SIGN    |                |



|         |                                   |        |                 |                                  |
|---------|-----------------------------------|--------|-----------------|----------------------------------|
| 0140    | 10103                             | 002002 | SZA             | SIGN?                            |
| 0141    | 10104                             | 015715 | JSB OUTCR       | YES, OUTPUT IT                   |
| 0142    | 10105                             | 060174 | LDA B1+1        | OUTPUT                           |
| 0143    | 10106                             | 114222 | JSB OUTIA,I     | THE INTEGER                      |
| 0144    | 10107                             | 126040 | JMP NUMOT,I     |                                  |
| 0145    | 10110                             | 003400 | NUM02 CCA       | SET 'FIXED'                      |
| 0146    | 10111                             | 073032 | STA FFLAG       | FLAG FALSE                       |
| 0147    | 10112                             | 061603 | LDA EXPON       | LOAD                             |
| 0148    | 10113                             | 066344 | LDB GETDG       | NUMBER                           |
| 0149    | 10114                             | 114236 | JSB .FADA,I     | IS NUMBER                        |
| 0150    | 10115                             | 000472 | DEF MAXFX       | LESS THAN                        |
| 0151    | 10116                             | 002021 | SSA,RSS         | 999999.5 ?                       |
| 0152    | 10117                             | 026127 | JMP NUM05       | NO                               |
| 0153    | 10120                             | 061603 | LDA EXPON       | YES, IS                          |
| 0154    | 10121                             | 066344 | LDB GETDG       | NUMBER                           |
| 0155    | 10122                             | 114236 | JSB .FADA,I     | LESS                             |
| 0156    | 10123                             | 000474 | DEF MINFX       | THAN                             |
| 0157    | 10124                             | 064335 | LDB .12         | 0.09999995?                      |
| 0158    | 10125                             | 002021 | SSA,RSS         |                                  |
| 0159    | 10126                             | 037032 | ISZ FFLAG       | NO, SET FFLAG = 0 AND SKIP       |
| 0160    | 10127                             | 064336 | NUM05 LDB .15   | YES, LOAD 'FLOATING' FIELD WIDTH |
| 0161    | 10130                             | 044133 | ADB CCNT        | SAVE                             |
| 0162    | 10131                             | 007004 | CMB,INB         | END-OF-FIELD                     |
| 0163    | 10132                             | 074172 | STB MLBX1+1     | MARKER                           |
| 0164    | 10133                             | 044370 | ADB .75         | ROOM                             |
| 0165    | 10134                             | 006020 | SSB             | ENOUGH?                          |
| 0166    | 10135                             | 000000 | NUM03 NOP       | NO                               |
| 0167**  |                                   |        |                 |                                  |
| 0168*** | OUTPUT A FLOATING POINT NUMBER ** |        |                 |                                  |
| 0169**  |                                   |        |                 |                                  |
| 0170    | 10136                             | 061603 | LDA EXPON       |                                  |
| 0171    | 10137                             | 071274 | STA MANT1       |                                  |
| 0172    | 10140                             | 066344 | LDB GETDG       | UNPACK                           |
| 0173    | 10141                             | 015456 | JSB .FLUN       |                                  |
| 0174    | 10142                             | 075336 | STB MANT2       | NUMBER                           |
| 0175    | 10143                             | 070154 | STA EXP         |                                  |
| 0176    | 10144                             | 060153 | LDA SIGN        |                                  |
| 0177    | 10145                             | 002002 | SZA             | SIGN?                            |
| 0178    | 10146                             | 015715 | JSB OUTCR       | YES, OUTPUT IT                   |
| 0179    | 10147                             | 002400 | CLA             | INITIALIZE COUNTER               |
| 0180    | 10150                             | 071603 | STA EXPON       | FOR DECIMAL EXPONENT             |
| 0181    | 10151                             | 050154 | CPA EXP         | EXPONENT ZERO?                   |
| 0182    | 10152                             | 026175 | JMP EOUT4       | YES                              |
| 0183    | 10153                             | 015147 | EOUT2 JSB MBY10 | NO,                              |
| 0184    | 10154                             | 060154 | LDA EXP         | MULTIPLY                         |
| 0185    | 10155                             | 003004 | CMA,INA         | NUMBER BY 10                     |
| 0186    | 10156                             | 002020 | SSA             | UNTIL                            |
| 0187    | 10157                             | 026162 | JMP *+3         | IT IS                            |
| 0188    | 10160                             | 035603 | ISZ EXPON       | GREATER                          |
| 0189    | 10161                             | 026153 | JMP EOUT2       | THAN 1                           |
| 0190    | 10162                             | 015200 | JSB DBY10       | DIVIDE BY 10                     |
| 0191    | 10163                             | 061603 | LDA EXPON       |                                  |
| 0192    | 10164                             | 064154 | EOLT3 LDB EXP   | DIVIDE                           |
| 0193    | 10165                             | 007004 | CMB,INB         | NUMBER                           |
| 0194    | 10166                             | 006021 | SSB,RSS         | BY 10                            |
| 0195    | 10167                             | 026175 | JMP EOUT4       | UNTIL                            |

|      |       |        |                 |                        |
|------|-------|--------|-----------------|------------------------|
| 0196 | 10170 | 071603 | STA EXPON       | IT IS                  |
| 0197 | 10171 | 015200 | JSB DBY10       | LESS                   |
| 0198 | 10172 | 003400 | CCA             | THAN                   |
| 0199 | 10173 | 041603 | ADA EXPON       | 1                      |
| 0200 | 10174 | 026164 | JMP EOUT3       |                        |
| 0201 | 10175 | 003000 | EOUT4 CMA       | SET EXPONENT           |
| 0202 | 10176 | 071603 | STA EXPON       | TO TRUE VALUE-1        |
| 0203 | 10177 | 064437 | LDB M7          | SET DIGIT              |
| 0204 | 10200 | 076370 | STB RETCR       | COUNTER                |
| 0205 | 10201 | 007400 | CCB             | SET DECIMAL            |
| 0206 | 10202 | 075677 | STB OUTLN       | POINT FLAG             |
| 0207 | 10203 | 057032 | CPB FFLAG       | FIXED POINT?           |
| 0208 | 10204 | 026213 | JMP EOUT6       | NO                     |
| 0209 | 10205 | 003000 | CMA             | YES, SET               |
| 0210 | 10206 | 071677 | STA OUTLN       | DECIMAL POINT FLAG     |
| 0211 | 10207 | 050324 | CPA .1          | .1?                    |
| 0212 | 10210 | 026217 | JMP EOUT5       | YES                    |
| 0213 | 10211 | 002021 | SSA,RSS         | LEADING DECIMAL POINT? |
| 0214 | 10212 | 026225 | JMP EOUT7+2     | YES                    |
| 0215 | 10213 | 016344 | EOUT6 JSB GETD0 | OUTPUT                 |
| 0216 | 10214 | 040357 | ADA .48         | A                      |
| 0217 | 10215 | 015715 | JSB OUTCR       | DIGIT                  |
| 0218 | 10216 | 026227 | JMP EOUT8       |                        |
| 0219 | 10217 | 060355 | EOUT5 LDA .46   | OUTPUT                 |
| 0220 | 10220 | 015715 | JSB OUTCR       | DECIMAL POINT          |
| 0221 | 10221 | 060357 | LDA .48         | OUTPUT                 |
| 0222 | 10222 | 026226 | JMP EOUT8-1     | LEADING ZERO           |
| 0223 | 10223 | 035677 | EOUT7 ISZ OUTLN | DECIMAL POINT NEXT?    |
| 0224 | 10224 | 026213 | JMP EOUT6       | NO                     |
| 0225 | 10225 | 060355 | LDA .46         | YES,                   |
| 0226 | 10226 | 015715 | JSB OUTCR       | OUTPUT IT              |
| 0227 | 10227 | 036370 | EOUT8 ISZ RETCR | MORE MANTISSA?         |
| 0228 | 10230 | 026223 | JMP EOUT7       | YES                    |
| 0229 | 10231 | 060133 | LDA CCNT        | NO,                    |
| 0230 | 10232 | 072101 | STA NUM01       | SAVE                   |
| 0231 | 10233 | 060132 | LDA BADDR       | OUTPUT                 |
| 0232 | 10234 | 072135 | STA NUM03       | POINTERS               |
| 0233 | 10235 | 016344 | JSB GETD0       | NEXT DIGIT             |
| 0234 | 10236 | 040435 | ADA M5          | FIVE OR                |
| 0235 | 10237 | 002020 | SSA             | GREATER?               |
| 0236 | 10240 | 026303 | JMP EOUT1       | NO                     |
| 0237 | 10241 | 003400 | CCA             | SET DECIMAL            |
| 0238 | 10242 | 071274 | ERND1 STA SYMCK | POINT COUNTER          |
| 0239 | 10243 | 016370 | JSB RETCR       | RETRIEVE CHARACTER     |
| 0240 | 10244 | 050355 | CPA .46         | DECIMAL POINT?         |
| 0241 | 10245 | 026241 | JMP ERND1-1     | YES, FLAG IT           |
| 0242 | 10246 | 015570 | JSB DIGCK       | NO, DIGIT?             |
| 0243 | 10247 | 026262 | JMP ERND2       | NO                     |
| 0244 | 10250 | 050333 | CPA .9          | YES, 9?                |
| 0245 | 10251 | 026254 | JMP **3         | YES                    |
| 0246 | 10252 | 040360 | ADA .49         | NO, BUMP               |
| 0247 | 10253 | 026276 | JMP ERND3       | DIGIT 1                |
| 0248 | 10254 | 060357 | LDA .48         | OVERLAY                |
| 0249 | 10255 | 015715 | JSB OUTCR       | A ZERO                 |
| 0250 | 10256 | 016370 | JSB RETCR       | BACKSPACE              |
| 0251 | 10257 | 003400 | CCA             | DECREMENT              |

|      |       |        |       |               |                           |
|------|-------|--------|-------|---------------|---------------------------|
| 0252 | 10260 | 041274 |       | ADA SYMCK     | DECIMAL POINT             |
| 0253 | 10261 | 026242 |       | JMP ERND1     | COUNTER                   |
| 0254 | 10262 | 015715 | ERN2  | JSB OUTCR     | RESTORE CHARACTER         |
| 0255 | 10263 | 035603 |       | ISZ EXPON     | CORRECT                   |
| 0256 | 10264 | 000000 |       | NOP           | EXPONENT                  |
| 0257 | 10265 | 060360 |       | LDA .49       | OVERLAY A 1               |
| 0258 | 10266 | 067032 |       | LDB FFLAG     | FIXED                     |
| 0259 | 10267 | 006002 |       | SZB           | POINT?                    |
| 0260 | 10270 | 026276 |       | JMP ERND3     | NO                        |
| 0261 | 10271 | 015715 |       | JSB OUTCR     | YES, OUTPUT CHARACTER     |
| 0262 | 10272 | 060357 |       | LDA .48       | PREPARE TO OVERLAY A ZERO |
| 0263 | 10273 | 035274 |       | ISZ SYMCK     | DECIMAL POINT NEXT?       |
| 0264 | 10274 | 026271 |       | JMP *-3       | NO                        |
| 0265 | 10275 | 060355 |       | LDA .46       | YES                       |
| 0266 | 10276 | 015715 | ERN3  | JSB OUTCR     |                           |
| 0267 | 10277 | 062101 |       | LDA NUM01     | RESTORE                   |
| 0268 | 10300 | 070133 |       | STA CCNT      | OUTPUT                    |
| 0269 | 10301 | 062135 |       | LDA NUM03     | POINTERS                  |
| 0270 | 10302 | 070132 |       | STA BADDR     |                           |
| 0271 | 10303 | 037032 | EOLT1 | ISZ FFLAG     | NO, FIXED POINT?          |
| 0272 | 10304 | 026333 |       | JMP EOUT9     | YES                       |
| 0273 | 10305 | 060364 |       | LDA E         | NO,                       |
| 0274 | 10306 | 015715 |       | JSB OUTCR     | OUTPUT 'E'                |
| 0275 | 10307 | 060354 |       | LDA .45       | LOAD '-'                  |
| 0276 | 10310 | 065603 |       | LDB EXPON     | POSITIVE                  |
| 0277 | 10311 | 006020 |       | SSB           | EXPONENT?                 |
| 0278 | 10312 | 007005 |       | CMR, INB, RSS | NO                        |
| 0279 | 10313 | 060353 |       | LDA .43       | YES, LOAD '+'             |
| 0280 | 10314 | 075603 |       | STB EXPON     |                           |
| 0281 | 10315 | 015715 |       | JSB OUTCR     | OUTPUT SIGN               |
| 0282 | 10316 | 065603 |       | LDB EXPON     |                           |
| 0283 | 10317 | 060357 |       | LDA .48       | COMPUTE                   |
| 0284 | 10320 | 044442 |       | ADB M10       |                           |
| 0285 | 10321 | 006020 |       | SSB           | EXPONENT                  |
| 0286 | 10322 | 026325 |       | JMP *-3       |                           |
| 0287 | 10323 | 002004 |       | INA           | DIGIT                     |
| 0288 | 10324 | 026320 |       | JMP *-4       |                           |
| 0289 | 10325 | 044361 |       | ADB .58       | COMPUTE                   |
| 0290 | 10326 | 075603 |       | STB EXPON     | SECOND DIGIT              |
| 0291 | 10327 | 015715 |       | JSB OUTCR     | OUTPUT                    |
| 0292 | 10330 | 061603 |       | LDA EXPON     |                           |
| 0293 | 10331 | 015715 |       | JSB OUTCR     | EXPONENT                  |
| 0294 | 10332 | 126040 |       | JMP NUMOT, I  |                           |
| 0295 | 10333 | 016370 | EOLT9 | JSB RETCR     | RETRIEVE CHARACTER        |
| 0296 | 10334 | 050357 |       | CPA .48       | ZERO?                     |
| 0297 | 10335 | 026340 |       | JMP EOU10     | YES                       |
| 0298 | 10336 | 015715 |       | JSB OUTCR     | NO, RESTORE CHARACTER     |
| 0299 | 10337 | 126040 |       | JMP NUMOT, I  |                           |
| 0300 | 10340 | 060345 | EOL10 | LDA .32       | OVERLAY                   |
| 0301 | 10341 | 015715 |       | JSB OUTCR     | A BLANK                   |
| 0302 | 10342 | 016370 |       | JSB RETCR     | BACKSPACE                 |
| 0303 | 10343 | 026333 |       | JMP EOUT9     |                           |

0305\*\*

0306\*\*\* GET DIGIT TO CUTPUT \*\*

0307\*\*

|      |       |        |         |         |                         |
|------|-------|--------|---------|---------|-------------------------|
| 0308 | 10344 | 000000 | GETDG   | NOP     |                         |
| 0309 | 10345 | 015147 | JSB     | MBY10   | MULTIPLY BY 10          |
| 0310 | 10346 | 064154 | LDB     | EXP     | GET EXPONENT IN (B)     |
| 0311 | 10347 | 007004 | CMB,INB |         | AS NEGATIVE             |
| 0312 | 10350 | 010430 | AND     | HIMSK   | KEEP 5 HIGH BITS OF (A) |
| 0313 | 10351 | 001200 | RAL     |         | NORMALIZE TO BIT 15     |
| 0314 | 10352 | 006024 | SSB,INB |         | ROTATE INTEGER          |
| 0315 | 10353 | 026351 | JMP *-2 |         | INTU (A)                |
| 0316 | 10354 | 010376 | AND     | MSK0    | EXTRACT                 |
| 0317 | 10355 | 070615 | STA     | NUMCK   | DIGIT                   |
| 0318 | 10356 | 064154 | LDB     | EXP     | ROTATE                  |
| 0319 | 10357 | 007004 | CMB,INB |         |                         |
| 0320 | 10360 | 001300 | RAR     |         | BACK                    |
| 0321 | 10361 | 006024 | SSB,INB |         |                         |
| 0322 | 10362 | 026360 | JMP *-2 |         |                         |
| 0323 | 10363 | 021274 | XOR     | MANT1   | REMOVE                  |
| 0324 | 10364 | 065336 | LDB     | MANT2   | DIGIT                   |
| 0325 | 10365 | 015113 | JSB     | NORML   | NORMALIZE REMAINDER     |
| 0326 | 10366 | 060615 | LDA     | NUMCK   | LOAD (A) WITH DIGIT     |
| 0327 | 10367 | 126344 | JMP     | GETDG,I |                         |

0328\*\*

0329\*\*\* RETRIEVE CHARACTER FROM OUTPUT BUFFER \*\*

0330\*\*

|      |       |        |         |         |                          |
|------|-------|--------|---------|---------|--------------------------|
| 0331 | 10370 | 000000 | REICR   | NOP     |                          |
| 0332 | 10371 | 064133 | LDB     | CCNT    | DECREMENT                |
| 0333 | 10372 | 044431 | ADB     | M1      | CHARACTER                |
| 0334 | 10373 | 074133 | STB     | CCNT    | COUNT                    |
| 0335 | 10374 | 160132 | LDA     | BADDR,I | POSITION                 |
| 0336 | 10375 | 006011 | SLB,RSS |         | AND                      |
| 0337 | 10376 | 001727 | ALF,ALF |         | EXTRACT                  |
| 0338 | 10377 | 010376 | AND     | MSK0    | CHARACTER                |
| 0339 | 10400 | 004010 | SLB     |         | FIRST CHARACTER OF WORD? |
| 0340 | 10401 | 126370 | JMP     | RETCR,I | NO                       |
| 0341 | 10402 | 064132 | LDB     | BADDR   | YES, DECREMENT           |
| 0342 | 10403 | 044431 | ADB     | M1      | BUFFER                   |
| 0343 | 10404 | 074132 | STB     | BADDR   | POINTER                  |
| 0344 | 10405 | 126370 | JMP     | RETCR,I |                          |

0345\*

0346\*

|      |       |    |     |       |
|------|-------|----|-----|-------|
| 0347 | 06074 | A1 | EQU | SETDP |
| 0348 | 06105 | A2 | EQU | STSRH |
| 0349 | 06147 | C1 | EQU | FLWST |
| 0350 | 06163 | C2 | EQU | FVSRH |

## LIBRARY ROUTINES

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0352*          *****
0353*          SUBROUTINE TO CALCULATE TAN(X)
0354*          *****
0355*
0356*          CALLED BY A JMP ETAN WITH THE ARGUMENT
0357*          IN FLOATING RADIAN IN THE REGISTERS.
0358*          THE FLOATING RESULT IS RETURNED IN A & B
0359*
0360 10406 114240 ETAN JSB .FMPI,I
0361 10407 010475      DEF FOP1      4/PI
0362 10410 072501      STA XTEMP
0363 10411 076502      STB XTEMP+1
0364 10412 114236      JSB .FADA,I
0365 10413 010477      DEF K1
0366 10414 017440      JSB .PWR2
0367 10415 177776      DEC -2
0368 10416 017413      JSB .IENT
0369 10417 014477      JSB ERROR
0370 10420 017432 TRGER JSB FLOAT
0371 10421 015423      JSB ARINV
0372 10422 017440      JSB .PWR2
0373 10423 000002      DEC 2
0374 10424 114236      JSB .FADA,I
0375 10425 010501      DEF XTEMP
0376 10426 072501      STA XTEMP
0377 10427 076502      STB XTEMP+1      X=X-4*ENTIER((X+1)/4)
0378 10430 114237      JSB .FSBA,I
0379 10431 010477      DEF K1
0380 10432 073032      STA SBOX      TEMPORARY
0381 10433 002020      SSA          X<1?
0382 10434 026467      JMP ELSE1      YES
0383 10435 062507      LDA K2          NO
0384 10436 066510      LDB K2+1
0385 10437 114237      JSB .FSBA,I
0386 10440 010501      DEF XTEMP
0387 10441 072503 BO1H1 STA YTEMP
0388 10442 076504      STB YTEMP+1      Y= 2-X
0389 10443 114240      JSB .FMPI,I
0390 10444 010503      DEF YTEMP
0391 10445 114240      JSB .FMPI,I
0392 10446 010507      DEF K2
0393 10447 114237      JSB .FSBA,I
0394 10450 010477      DEF K1
0395 10451 017324      JSB .CHEB
0396 10452 010511      DEF COEFF
0397 10453 114240      JSB .FMPI,I
0398 10454 010503      DEF YTEMP
0399 10455 072503      STA YTEMP
0400 10456 076504      STB YTEMP+1      Y=Y*CHEBY(2*Y**2-1)
0401 10457 063032      LDA SBOX
0402 10460 002020      SSA          X<1 ?
0403 10461 026472      JMP ELSE2      YES
0404 10462 062477      LDA K1
0405 10463 066500      LDB K1+1
0406 10464 114241      JSB .FDVA,I
0407 10465 010503      DEF YTEMP

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PAGE 0116 #08 LIBRARY ROUTINES

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0408 10466 124264      JMP FR12A,I      ANS = 1/Y
0409 10467 062501  ELSE1 LDA XTEMP
0410 10470 066502      LDB XTEMP+1
0411 10471 026441      JMP BOTH1      Y=X
0412 10472 062503  ELSE2 LDA YTEMP
0413 10473 066504      LDB YTEMP+1
0414 10474 124264      JMP FR12A,I      ANS = Y
0415*
0416 10475 050574  FOP1  DEC 1.273239545      4/PI
0417 10477 040000  K1    DEC 1.
0418 10501 000000  XTEMP BSS 2
0419 10503 000000  YTEMP BSS 2
0420 10505 000000  UTEMP BSS 2
0421 10507 040000  K2    DEC 2.
0422 10511 076061  COEFF DEC 1.4458E-8
0423 10513 066034      DEC 2.013766E-7
0424 10515 057035      DEC 2.804816E-6
0425 10517 050755      DEC 3.906637E-5
0426 10521 043523      DEC 5.4417038E-4
0427 10523 076112      DEC 7.586101578E-3
0428 10525 066520      DEC .10675392857
0429 10527 070512      DEC 1.7701474227
0430 10531 000000      OCT 0

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0432*          *****
0433*          SUBROUTINE TO CALCULATE ATN(X)
0434*          *****
0435*
0436*          CALLED BY A JMP EATN WITH THE ARGUMENT
0437*          IN FLOATING POINT FORM IN THE REGISTERS.
0438*          THE FLOATING RESULT IN THE RANGE -PI/2
0439*          TO PI/2 IS RETURNED IN A & B
0440*
0441 10532 072501 EATN STA XTEMP
0442 10533 076502      STB XTEMP+1
0443 10534 060001      LDA 1
0444 10535 010376      AND MSK0
0445 10536 073032      STA SBOX          TAN = EXP OF (X)
0446 10537 002002      SZA
0447 10540 000010      SLA          ABS (X) > 1 ?
0448 10541 026576      JMP EL81          NO
0449 10542 062477      LDA K1
0450 10543 066500      LDB K1+1
0451 10544 114241      JSB .FDVA,I
0452 10545 010501      DEF XTEMP          U=1/X
0453 10546 072505      BTB-1 STA UTEMP
0454 10547 076506      STB UTEMP+1
0455 10550 114240      JSB .FMFA,I
0456 10551 010505      DEF UTEMP
0457 10552 114240      JSB .FMFA,I
0458 10553 010507      DEF K2
0459 10554 114237      JSB .FSBA,I
0460 10555 010477      DEF K1
0461 10556 017324      JSB .CHEB
0462 10557 010615      DEF COEF
0463 10560 114240      JSB .FMFA,I
0464 10561 010505      DEF UTEMP
0465 10562 072503      STA YTEMP
0466 10563 076504      STB YTEMP+1          Y=U*CHEBY(2*U**2-1)
0467 10564 063032      LDA SBOX
0468 10565 002002      SZA
0469 10566 000010      SLA          ABS(X)>1 ?
0470 10567 026601      JMP EL82          NO
0471 10570 062501      LDA XTEMP
0472 10571 002020      SSA          X<0 ?
0473 10572 026604      JMP EL83          YES
0474 10573 062611      LDA PIBY2
0475 10574 066612      LDB PIBY2+1
0476 10575 026606      JMP EL83+2          ANS = PI/2 - Y
0477 10576 062501      EL81 LDA XTEMP
0478 10577 066502      LDB XTEMP+1
0479 10600 026546      JMP BTH1          U=X
0480 10601 062503      EL82 LDA YTEMP
0481 10602 066504      LDB YTEMP+1
0482 10603 124264      JMP FR12A,I          ANS = Y
0483 10604 062613      EL83 LDA MP2
0484 10605 066614      LDB MP2+1
0485 10606 114237      JSB .FSBA,I
0486 10607 010503      DEF YTEMP          ANS=-PI/2-Y
0487 10610 124264      JMP FR12A,I

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0488\*

|      |       |        |       |     |                 |       |
|------|-------|--------|-------|-----|-----------------|-------|
| 0489 | 10611 | 062207 | PIBY2 | DEC | 1.5707963268    | PI/2  |
| 0490 | 10613 | 115570 | MP2   | DEC | -1.5707963268   | -PI/2 |
| 0491 | 10615 | 106671 | COEF  | DEC | -1.33034E-8     |       |
| 0492 | 10617 | 056335 |       | DEC | 8.64888E-8      |       |
| 0493 | 10621 | 131601 |       | DEC | -56.99186E-8    |       |
| 0494 | 10623 | 040033 |       | DEC | 3.821037E-6     |       |
| 0495 | 10625 | 111013 |       | DEC | -2.6215196E-5   |       |
| 0496 | 10627 | 060542 |       | DEC | 1.8574297E-4    |       |
| 0497 | 10631 | 122573 |       | DEC | -1.381195004E-3 |       |
| 0498 | 10633 | 055471 |       | DEC | .01113584206    |       |
| 0499 | 10635 | 111620 |       | DEC | -.1058929245    |       |
| 0500 | 10637 | 070320 |       | DEC | 1.762747174     |       |
| 0501 | 10641 | 000000 |       | OCT | 0               |       |

0503\*

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0504\*

SUEROUTINE TO COMPUTE ABS(X)

0505\*

\*\*\*\*\*

0506\*

0507\*

CALLLED BY A JMP EABS WITH THE ARGUMENT  
IN FLOATING POINT FORM IN THE REGISTERS.  
THE ABSOLUTE VALUE IN FLOATING POINT  
IS RETURNED IN A & B

0508\*

0509\*

0510\*

0511\*

|      |       |        |      |             |                |
|------|-------|--------|------|-------------|----------------|
| 0512 | 10642 | 002020 | EABS | SSA         | NEGATIVE?      |
| 0513 | 10643 | 015423 |      | JSB ARINV   | YES, NEGATE IT |
| 0514 | 10644 | 124264 |      | JMP FR12A,I |                |

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0002*          *****
0003*          SUBROUTINE TO CALCULATE SIN(X)
0004*          *****
0005*
0006*          CALLED BY A JMP ESIN WITH THE ARGUMENT
0007*          IN FLOATING RADIANIS IN THE REGISTERS.
0008*          THE FLOATING RESULT IS RETURNED IN A & B
0009*
0010  10645  114236  ECCS   JSB .FADA,I
0011  10646  010611      DEF PIBY2
0012  10647  114240  ESIN  JSB .FMFA,I
0013  10650  010717      DEF TOPI
0014  10651  072501      STA XTEMP
0015  10652  076502      STB XTEMP+1      X=2*X/PI
0016  10653  114236      JSB .FADA,I
0017  10654  010477      DEF K1
0018  10655  017440      JSB .PWR2
0019  10656  177776      DEC -2
0020  10657  017413      JSB .IENT
0021  10660  026417      JMP TRGER-1      ERROR IF EXPONENT >= 15
0022  10661  017432      JSB FLOAT
0023  10662  114240      JSB .FMFA,I
0024  10663  010721      DEF MM4
0025  10664  114236      JSB .FADA,I
0026  10665  010501      DEF XTEMP
0027  10666  072501      STA XTEMP
0028  10667  076502      STB XTEMP+1      X=X-4*ENTIER((X+1)/4)
0029  10670  114237      JSB .FSBA,I
0030  10671  010477      DEF K1
0031  10672  002020      SSA          X<1 ?
0032  10673  026702      JMP PAST      YES
0033  10674  062507      LDA K2
0034  10675  066510      LDB K2+1
0035  10676  114237      JSB .FSBA,I
0036  10677  010501      DEF XTEMP
0037  10700  072501      STA XTEMP
0038  10701  076502      STB XTEMP+1      X=2-X
0039  10702  062501  PAST  LDA XTEMP
0040  10703  066502      LDB XTEMP+1
0041  10704  114240      JSB .FMFA,I
0042  10705  010501      DEF XTEMP
0043  10706  017440      JSB .PWR2
0044  10707  000001      DEC 1
0045  10710  114237      JSB .FSBA,I
0046  10711  010477      DEF K1
0047  10712  017324      JSB .CHEB
0048  10713  010723      DEF COEF1
0049  10714  114240      JSB .FMFA,I
0050  10715  010501      DEF XTEMP
0051  10716  124264      JMP FR12A,I      ANS=X+CHEBY(2*X**2-1)
0052*
0053  10717  050574  TOPI  DEC .636619772      2/PI
0054  10721  100000  MM4   DEC -4.
0055  10723  047605  COEF1 DEC 1.18496E-6
0056  10725  134143      DEC -1.365875E-4
0057  10727  045261      DEC 9.118016E-3

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PAGE 0120 #09 LIBRARY ROUTINES

|      |       |        |                  |
|------|-------|--------|------------------|
| 0058 | 10731 | 133371 | DEC -.2862615692 |
| 0059 | 10733 | 050656 | DEC 2.5525579248 |
| 0060 | 10735 | 000000 | OCT 0            |

|       |   |        |   |
|-------|---|--------|---|
| 0062* | *****   |        |   |
| 0063* | SUBROUTINE TO COMPUTE RND(X)                                  |        |   |
| 0064* | *****   |        |   |
| 0065* |   |        |   |
| 0066* | THE ARGUMENT OF RND IS A DUMMY ONE                            |        |   |
| 0067* | THE ROUTINE GENERATES A RANDOM NUMBER                         |        |   |
| 0068* | IN THE A & B REGISTERS  |        |   |
| 0069* |   |        |   |
| 0070* | R=X/M, X=C*X MOD M, M=2 <sup>31</sup> , C=2 <sup>15</sup> + 3 |        |   |
| 0071* |   |        |   |
| 0072  | 10736   | 002400 | ERNU CLA X IS INITIALLY 1                           |
| 0073  | 10737   | 070154 | STA EXP INITIALIZE EXPONENT                         |
| 0074  | 10740   | 060155 | LDA XH COMPUTE                                      |
| 0075  | 10741   | 001000 | ALS HIGH  |
| 0076  | 10742   | 040155 | ADA XH PART   |
| 0077  | 10743   | 064156 | LDB XL 2*XH   |
| 0078  | 10744   | 004065 | CLE,ERB + XH +                                      |
| 0079  | 10745   | 040001 | ADA 1 XL*2 <sup>15</sup>                            |
| 0080  | 10746   | 064156 | LDB XL  |
| 0081  | 10747   | 005275 | RBL,CLE,SLB,ERB ADD XL[15] TO                       |
| 0082  | 10750   | 002004 | INA (A) (FROM 2*XL)                                 |
| 0083  | 10751   | 004066 | CLE,ELB 2*XL  |
| 0084  | 10752   | 044156 | ADB XL + XL   |
| 0085  | 10753   | 001675 | ELA,CLE,SLA,ERA ADD OVERFLOW                        |
| 0086  | 10754   | 002104 | CLE,INA TO (A)                                      |
| 0087  | 10755   | 044470 | ADB FLGBT ADD IN TRAILING BIT OF XL*2 <sup>15</sup> |
| 0088  | 10756   | 002040 | SEZ ADD OVERFLOW                                    |
| 0089  | 10757   | 002004 | INA TO (A)  |
| 0090  | 10760   | 001665 | ELA,CLE,ERA ERASE A[15]                             |
| 0091  | 10761   | 070155 | STA XH STORE  |
| 0092  | 10762   | 074156 | STB XL INTEGER                                      |
| 0093  | 10763   | 015020 | JSB .PACK NORMALIZE AND PACK                        |
| 0094  | 10764   | 124264 | JMP FR12A,I   |

```

0096*          *****
0097*          SUBROUTINE TO CALCULATE SQR(X)
0098*          *****
0099*
0100*          CALLED BY A JMP ESQR WITH THE ARGUMENT
0101*          IN FLOATING POINT FORM IN THE REGISTERS.
0102*          THE FLOATING RESULT IS RETURNED IN A & B
0103*
0104  10765 002003  ESQR  SZA,RSS          X=0 ?
0105  10766 124264          JMP FR12A,I      YES, ANS = 0
0106  10767 002020          SSA              X<0 ?
0107  10770 014477          JSB ERROR        YES ERROR
0108  10771 072501  SQRER  STA XTEMP
0109  10772 015456          JSB .FLUN
0110  10773 000031          SLA,ARS          EXP(X) ODD?
0111  10774 027034          JMP ODD
0112  10775 040431          ADA M1
0113  10776 073032          STA SBOX          SBOX=EXPO(X)/2-1
0114  10777 076502          STB XTEMP+1      LOW MANTISSA/2
0115  11000 062501          LDA XTEMP
0116  11001 114240          JSB .FMFA,I
0117  11002 011047          DEF SA2
0118  11003 114236          JSB .FADA,I
0119  11004 011053          DEF SB2          Y=SB2+SA2*X
0120  11005 072503  BTH2  STA YTEMP
0121  11006 076504          STB YTEMP+1
0122  11007 062501          LDA XTEMP
0123  11010 066502          LDB XTEMP+1
0124  11011 114241          JSB .FDVA,I
0125  11012 010503          DEF YTEMP
0126  11013 114236          JSB .FADA,I
0127  11014 010503          DEF YTEMP
0128  11015 017440          JSB .PWR2
0129  11016 177777          DEC -1
0130  11017 072503          STA YTEMP
0131  11020 076504          STB YTEMP+1      Y=(Y+X/Y)/2
0132  11021 062501          LDA XTEMP
0133  11022 066502          LDB XTEMP+1
0134  11023 114241          JSB .FDVA,I
0135  11024 010503          DEF YTEMP
0136  11025 114236          JSB .FADA,I
0137  11026 010503          DEF YTEMP
0138  11027 072503          STA YTEMP
0139  11030 076504          STB YTEMP+1
0140  11031 017440          JSB .PWR2
0141  11032 000000  SBCX  OCT 0
0142  11033 124264          JMP FR12A,I      ANS=(P+F/P)*2**SBOX
0143  11034 073032  ODD   STA SBOX          SBOX = EXP(X)/2
0144  11035 044376          ADB MSK0
0145  11036 076502          STB XTEMP+1      LOW MANTISSA/2
0146  11037 062501          LDA XTEMP
0147  11040 114240          JSB .FMFA,I
0148  11041 011045          DEF SA1
0149  11042 114236          JSB .FADA,I
0150  11043 011051          DEF SB1
0151  11044 027005          JMP BTH2          Y=SB1+SA1*X

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0152\*

|      |       |        |     |             |
|------|-------|--------|-----|-------------|
| 0153 | 11045 | 070000 | SA1 | DEC .875    |
| 0154 | 11047 | 045000 | SA2 | DEC .578125 |
| 0155 | 11051 | 043524 | SB1 | DEC .27863  |
| 0156 | 11053 | 066000 | SB2 | DEC .421875 |

0158\*

0159\*

0160\*

0161\*

0162\*

0163\*

0164\*

0165\*

0166\*

0167\*

0168\*

\*\*\*\*\*

SUBROUTINE TO CALCULATE INT(X)

\*\*\*\*\*

CALLLED BY A JMP EINT WITH THE ARGUMENT  
IN FLOATING POINT FORM IN THE REGISTERS.  
ENTIER(X) IS FLOATED AND RETURNED IN A & B

CALCULATES THE FLOATING POINT EQUIVALENT  
OF ENTIER(X)

|      |       |        |       |             |                 |
|------|-------|--------|-------|-------------|-----------------|
| 0169 | 11055 | 077032 | EINT  | STB SBOX    | SAVE LOW WORD   |
| 0170 | 11056 | 064344 |       | LDB .31     | PRESET BIAS FOR |
| 0171 | 11057 | 074154 |       | STB EXP     | BINARY POINT    |
| 0172 | 11060 | 067032 |       | LDB SBOX    | 24-BIT          |
| 0173 | 11061 | 015364 |       | JSB IFIX    | INTEGER?        |
| 0174 | 11062 | 027065 |       | JMP EINT1   | NO              |
| 0175 | 11063 | 015020 |       | JSB .PACK   | YES, PACK IT    |
| 0176 | 11064 | 124264 |       | JMP FR12A,I |                 |
| 0177 | 11065 | 061614 | EINT1 | LDA GETCR   | RETRIEVE        |
| 0178 | 11066 | 067032 |       | LDB SBOX    | NUMBER          |
| 0179 | 11067 | 124264 |       | JMP FR12A,I |                 |

```

0181*
0182*
0183*
0184*
0185*
0186*
0187*
0188*
0189 11070 017072 ELCG JSB .LOG
0190 11071 124264 JMP FR12A,I
0191 11072 000000 .LCG NOP
0192 11073 002003 SZB,RSS NON-ZERO ARGUMENT?
0193 11074 027150 JMP .LOG1 NO
0194 11075 002020 SSA YES, POSITIVE ARGUMENT?
0195 11076 014477 JSB ERROR NO
0196 11077 072501 LOGER STA XTEMP YES
0197 11100 015456 JSB .FLUN
0198 11101 076502 STB XTEMP+1
0199 11102 017432 JSB FLOAT
0200 11103 072503 STA YTEMP
0201 11104 076504 STB YTEMP+1 Y=EXPO(X)
0202 11105 062501 LDA XTEMP
0203 11106 066502 LDB XTEMP+1
0204 11107 114236 JSB .FADA,I
0205 11110 011154 DEF R22
0206 11111 072505 STA UTEMP
0207 11112 076506 STB UTEMP+1 U=X+SQR(0.5)
0208 11113 062501 LDA XTEMP
0209 11114 066502 LDB XTEMP+1
0210 11115 114237 JSB .FSBA,I
0211 11116 011154 DEF R22
0212 11117 114241 JSB .FDVA,I
0213 11120 010505 DEF UTEMP
0214 11121 072505 STA UTEMP
0215 11122 076506 STB UTEMP+1 U=(X-SQR(0.5))/U
0216 11123 114240 JSB .FMFA,I
0217 11124 010505 DEF UTEMP
0218 11125 114237 JSB .FSBA,I
0219 11126 011164 DEF CCC
0220 11127 072501 STA XTEMP
0221 11130 076502 STB XTEMP+1
0222 11131 063162 LDA MB
0223 11132 067163 LDB MB+1
0224 11133 114241 JSB .FDVA,I
0225 11134 010501 DEF XTEMP
0226 11135 114236 JSB .FADA,I
0227 11136 011160 DEF AAA
0228 11137 114240 JSB .FMFA,I
0229 11140 010505 DEF UTEMP
0230 11141 114237 JSB .FSBA,I
0231 11142 000466 DEF HALF
0232 11143 114236 JSB .FADA,I
0233 11144 010503 DEF YTEMP
0234 11145 114240 JSB .FMFA,I
0235 11146 011156 DEF LE2
0236 11147 127072 JMP .LOG,I ANS=LOG(2)*(EXPO(X)-0.5+U*

```

|       |       |        |       |                   |                 |
|-------|-------|--------|-------|-------------------|-----------------|
| 0237* |       |        |       |                   | (A-B/X))        |
| 0238  | 11150 | 014477 | .LCG1 | JSB ERROR         | LOG OF ZERO     |
| 0239  | 11151 | 060470 | LNZR  | LDA MNEG          | RETURN          |
| 0240  | 11152 | 064400 |       | LDB B776          | NEGATIVE        |
| 0241  | 11153 | 127072 |       | JMP .LOG,I        | INFINITY        |
| 0242* |       |        |       |                   |                 |
| 0243  | 11154 | 055202 | R22   | DEC .707106781    | SQR(0.5)        |
| 0244  | 11156 | 054271 | LE2   | DEC .6931471806   | LOG BASE E OF 2 |
| 0245  | 11160 | 051260 | AAA   | DEC 1.2920070987  |                 |
| 0246  | 11162 | 125606 | MB    | DEC -2.6398577035 |                 |
| 0247  | 11164 | 065010 | CCC   | DEC 1.6567626301  |                 |

|       |       |        |      |  |                       |
|-------|-------|--------|------|--|-----------------------|
| 0249* |       |        |      | *****                                    |                       |
| 0250* |       |        |      | SUEROUTINE TO COMPUTE SGN(X)             |                       |
| 0251* |       |        |      | *****                                    |                       |
| 0252* |       |        |      |  |                       |
| 0253* |       |        |      | CALL BY A JMP ESGN WITH THE ARGUMENT     |                       |
| 0254* |       |        |      | IN FLOATING POINT FORM IN THE REGISTERS. |                       |
| 0255* |       |        |      | ON RETURN A & B CONTAIN THE FOLLOWING:   |                       |
| 0256* |       |        |      |  |                       |
| 0257* |       |        |      | IF X>0 THEN +1.                          |                       |
| 0258* |       |        |      | IF X=0 THEN 0                            |                       |
| 0259* |       |        |      | IF X<0 THEN -1.                          |                       |
| 0260* |       |        |      |  |                       |
| 0261  | 11166 | 006400 | ESGN | CLB                                      |                       |
| 0262  | 11167 | 002003 |      | SZA,RSS                                  | ZERO?                 |
| 0263  | 11170 | 124264 |      | JMP FR12A,1                              | YES                   |
| 0264  | 11171 | 002021 |      | SSA,RSS                                  | NO, POSITIVE?         |
| 0265  | 11172 | 064325 |      | LDB .2                                   | YES, SET EXPONENT     |
| 0266  | 11173 | 060470 |      | LDA FLGBT                                | LOAD MANTISSA         |
| 0267  | 11174 | 006002 |      | SZB                                      | POSITIVE?             |
| 0268  | 11175 | 001300 |      | RAR                                      | YES, CORRECT MANTISSA |
| 0269  | 11176 | 124264 |      | JMP FR12A,1                              |                       |

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0271*          *****
0272*          SUBROUTINE TO CALCULATE EXP(X)
0273*          *****
0274*
0275*          CALLED BY A JMP EEXP WITH THE ARGUMENT
0276*          IN FLOATING POINT FORM IN THE REGISTERS.
0277*          THE FLOATING RESULT IS RETURNED IN A & B
0278*
0279 11177 017201 EEXP JSB .EXP
0280 11200 124264 JMP FR12A,I
0281 11201 000000 .EXP NOP
0282 11202 114240 JSB .FMFA,I
0283 11203 011322 DEF L2E
0284 11204 072501 STA XTEMP
0285 11205 076502 STB XTEMP+1 X=Z*LOG2(E)
0286 11206 017413 JSB .IENT
0287 11207 027301 JMP .EXP1
0288 11210 073274 STA INTE INTE = ENTIER(X)
0289 11211 017432 JSB FLOAT
0290 11212 072503 STA YTEMP
0291 11213 076504 STB YTEMP+1 Y=ENTIER(X)
0292 11214 063274 LDA INTE
0293 11215 043310 ADA M124
0294 11216 002021 SSA,RSS INTE >=124 ?
0295 11217 027304 JMP EXPR-1 YES,ERROR
0296 11220 043311 ADA .244 INTE <=-120 ?
0297 11221 002020 SSA
0298 11222 027276 JMP ZERE YES,ANS=0
0299 11223 062501 LDA XTEMP
0300 11224 066502 LDB XTEMP+1
0301 11225 114237 JSB .FSBA,I
0302 11226 010503 DEF YTEMP
0303 11227 072501 STA XTEMP
0304 11230 076502 STB XTEMP+1 X=X-ENTIER(X)
0305 11231 114240 JSB .FMFA,I
0306 11232 010501 DEF XTEMP
0307 11233 072505 STA UTEMP
0308 11234 076506 STB UTEMP+1 U=X**2
0309 11235 114236 JSB .FADA,I
0310 11236 011312 DEF AAAA
0311 11237 072503 STA YTEMP
0312 11240 076504 STB YTEMP+1 Y=X**2+AAAA
0313 11241 063314 LDA BBBB
0314 11242 067315 LDB BBBB+1
0315 11243 114241 JSB .FDVA,I
0316 11244 010503 DEF YTEMP
0317 11245 072503 STA YTEMP
0318 11246 076504 STB YTEMP+1 Y=BBBB/Y
0319 11247 063316 LDA CCCC
0320 11250 067317 LDB CCCC+1
0321 11251 114240 JSB .FMFA,I
0322 11252 010505 DEF UTEMP
0323 11253 114236 JSB .FADA,I
0324 11254 011320 DEF DDDD
0325 11255 114237 JSB .FSBA,I
0326 11256 010501 DEF XTEMP

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|       |       |        |       |                  |                                     |
|-------|-------|--------|-------|------------------|-------------------------------------|
| 0327  | 11257 | 114237 |       | JSB .FSBA,I      |                                     |
| 0328  | 11260 | 010503 |       | DEF YTEMP        |                                     |
| 0329  | 11261 | 072503 |       | STA YTEMP        |                                     |
| 0330  | 11262 | 076504 |       | STB YTEMP+1      | $Y = -X + DDDD + CCCC * X ** 2 - Y$ |
| 0331  | 11263 | 062501 |       | LDA XTEMP        |                                     |
| 0332  | 11264 | 066502 |       | LDB XTEMP+1      |                                     |
| 0333  | 11265 | 114241 |       | JSB .FDVA,I      |                                     |
| 0334  | 11266 | 010503 |       | DEF YTEMP        |                                     |
| 0335  | 11267 | 114236 |       | JSB .FADA,I      |                                     |
| 0336  | 11270 | 000466 |       | DEF HALF         |                                     |
| 0337  | 11271 | 037274 |       | ISZ INTE         |                                     |
| 0338  | 11272 | 000000 |       | NOP              |                                     |
| 0339  | 11273 | 017440 |       | JSB .PWR2        |                                     |
| 0340  | 11274 | 000000 | INTE  | OCT 0            |                                     |
| 0341  | 11275 | 127201 |       | JMP .EXP,I       | $ANS = (0.5 + X/Y) * 2 ** INTE$     |
| 0342  | 11276 | 002400 | ZERE  | CLA              |                                     |
| 0343  | 11277 | 006400 |       | CLB              |                                     |
| 0344  | 11300 | 127201 |       | JMP .EXP,I       | $ANS = 0$                           |
| 0345  | 11301 | 063401 | .EXP1 | LDA X2TMP        |                                     |
| 0346  | 11302 | 002020 |       | SSA              |                                     |
| 0347  | 11303 | 027276 |       | JMP ZERE         |                                     |
| 0348  | 11304 | 014477 |       | JSB ERROR        |                                     |
| 0349  | 11305 | 060422 | EXPER | LDA INF          |                                     |
| 0350  | 11306 | 064432 |       | LDB M2           |                                     |
| 0351  | 11307 | 127201 |       | JMP .EXP,I       |                                     |
| 0352* |       |        |       |                  |                                     |
| 0353  | 11310 | 177604 | M124  | DEC -124         |                                     |
| 0354  | 11311 | 000364 | .244  | DEC 244          |                                     |
| 0355  | 11312 | 053552 | AAAA  | DEC 87.417497202 |                                     |
| 0356  | 11314 | 046477 | BBBB  | DEC 617.9722695  |                                     |
| 0357  | 11316 | 043372 | CCCC  | DEC .03465735903 |                                     |
| 0358  | 11320 | 047643 | DDDD  | DEC 9.9545957821 |                                     |
| 0359  | 11322 | 056125 | L2E   | DEC 1.4426950409 |                                     |

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0361*          *****
0362*          SUBROUTINE TO COMPUTE CHEBY(X)
0363*          *****
0364*
0365*          CALLING SEQUENCE:
0366*
0367*          LDA X          (FLOATING)
0368*          LDB X+1
0369*          JSB .CHEB      (RESULT FLOATING)
0370*          DEF C          (TABLE OF CHEBY.COEFFS.,FLOATING)
0371*
0372 11324 000000 .CHEB NOP
0373 11325 114240 JSB .FMPA,I
0374 11326 010507 DEF K2
0375 11327 073401 STA X2TMP
0376 11330 077402 STB X2TMP+1      X2 =X*2
0377 11331 167324 LDB .CHEB,I
0378 11332 077407 STB CTMP      C POINTS TO COEFFICIENT TABLE
0379 11333 160001 LDA 1,I
0380 11334 006004 INB
0381 11335 164001 LDB 1,I      GET FIRST COEFF
0382 11336 073411 STA DTMP
0383 11337 077412 STB DTMP+1    D=C(N)
0384 11340 002400 CLA
0385 11341 073405 STA BTMP
0386 11342 073406 STA BTMP+1    B=0
0387 11343 037407 LOPC ISZ CTMP
0388 11344 037407 ISZ CTMP      N=N-1
0389 11345 163407 LDA CTMP,I
0390 11346 002003 SZA,RSS      C(N)=0 ?
0391 11347 027371 JMP COUT      ZERO FLAGS END OF TABLE
0392 11350 063405 LDA BTMP      NO
0393 11351 067406 LDB BTMP+1
0394 11352 073403 STA ATMP
0395 11353 077404 STB ATMP+1    A=B
0396 11354 063411 LDA DTMP
0397 11355 067412 LDB DTMP+1
0398 11356 073405 STA BTMP
0399 11357 077406 STB BTMP+1    B=D
0400 11360 114240 JSB .FMPA,I
0401 11361 011401 DEF X2TMP
0402 11362 114237 JSB .FSBA,I
0403 11363 011403 DEF ATMP
0404 11364 114236 JSB .FADA,I
0405 11365 111407 DEF CTMP,I
0406 11366 073411 STA DTMP
0407 11367 077412 STB DTMP+1    D=C(N) -A+B*X2
0408 11370 027343 JMP LOPC
0409 11371 063411 COLT LDA DTMP
0410 11372 067412 LDB DTMP+1
0411 11373 114237 JSB .FSBA,I
0412 11374 011403 DEF ATMP
0413 11375 114240 JSB .FMPA,I
0414 11376 000466 DEF HALF
0415 11377 037324 ISZ .CHEB
0416 11400 127324 JMP .CHEB,I      ANS=(D-A)/2

```

0417\*

0418 11401 000000 X2TMP BSS 2  
 0419 11403 000000 ATMP BSS 2  
 0420 11405 000000 BTMP BSS 2  
 0421 11407 000000 CTMP BSS 2  
 0422 11411 000000 DTMP BSS 2

0424\*

0425\* \*\*\*\*\*  
 0426\* SUBROUTINE TO COMPUTE THE ENTIER OF A NUMBER  
 0427\* WHOSE EXPONENT IS LESS THAN 15  
 0428\* \*\*\*\*\*

0429\*

CALLING SEQUENCE:

0430\*

0431\* LDA X (FLOATING)  
 0432\* LDA X+1  
 0433\* JSB .IENT. (RESULT INTERGER)  
 0434\* JSB ERROR (EXIT IF EXPO(X)>14)

0435\*

0436\*

0437 11413 000000 .IENT NOP  
 0438 11414 073401 STA X2TMP STORE HIGH PART  
 0439 11415 060001 LDA 1 MOVE LOW PART TO A  
 0440 11416 010376 AND MSK0 ISOLATE EXPONENT  
 0441 11417 000033 SLA,RAR  
 0442 11420 027424 JMP ++4 IF NEGATIVE OK  
 0443 11421 040444 ADA M15  
 0444 11422 002021 SSA,RSS EXPO(X) > 14  
 0445 11423 127413 JMP .IENT,I YES, ERROR RETURN  
 0446 11424 037413 ISZ .IENT NO BUMP RETURN POINT  
 0447 11425 063401 LDA X2TMP RESTORE HIGH PART  
 0448 11426 015364 JSB IFIX CALL ENTIER  
 0449 11427 000000 NOP  
 0450 11430 060001 LDA 1 PUT RESULT INTO (A)  
 0451 11431 127413 JMP .IENT,I

```

0453* *****
0454* SUBROUTINE TO FLOAT AN INTEGER
0455* *****
0456*
0457* CALLED BY JSB FLOAT WITH INTEGER IN A
0458* THE FLOATING POINT EQUIVALENT IS RETURNED
0459* IN A & B
0460*
0461 11432 000000 FLCAT NOP
0462 11433 064336 LDB .15
0463 11434 074154 STB EXP
0464 11435 006400 CLB
0465 11436 015020 JSB .PACK
0466 11437 127432 JMP FLOAT,I

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```

0468* *****
0469* SUBROUTINE TO MULTIPLY BY A POWER OF TWO
0470* *****
0471*
0472* CALLING SEQUENCE
0473*
0474* LDA X          (FLOATING)
0475* LDB X+1
0476* JSB .PWR2      (RESULT FLOATING)
0477* DEC N          (INTEGER POWER)
0478*
0479* RETURNS WITH X*2^N IN A&B
0480* NO CHECK IS MADE FOR EXPONENT
0481* OVERFLOW OR UNDERFLOW
0482*
0483 11440 000000 .PWR2 NOP
0484 11441 002003 SZA,RSS          X=0 ?
0485 11442 027454 JMP .RET        YES, ANS=0
0486 11443 073401 STA X2TMP
0487 11444 015456 JSB .FLUN
0488 11445 077402 STB X2TMP+1
0489 11446 143440 ADA .PWR2,I
0490 11447 001200 RAL
0491 11450 010376 AND MSK0      NEW EXPO = (OLD EXPO) +N
0492 11451 070001 STA 1
0493 11452 047402 ADB X2TMP+1    KEEP OLD MANTISSA
0494 11453 063401 LDA X2TMP
0495 11454 037440 .RET ISZ .PWR2
0496 11455 127440 JMP .PWR2,I

```

```

0498 07463 TT1 EQU .FDV
0499 07552 TT2 EQU IDIV
0500 00163 TT3 EQU TEMPS+4
0501 00164 TT4 EQU TEMPS+5
0502 11032 FFLAG EQU SBOX

```

```

0002*
0003*
0004*
0005 11456 160157
0006 11457 034157
0007 11460 010401
0008 11461 002002
0009 11462 027610
0010 11463 160157
0011 11464 010420
0012 11465 070171
0013 11466 050416
0014 11467 002001
0015 11470 114250
0016*
0017 11471 160157
0018 11472 010401
0019 11473 002003
0020 11474 124256
0021 11475 114231
0022 11476 006007
0023 11477 124267
0024 11500 034157
0025 11501 160001
0026 11502 070173
0027 11503 060171
0028 11504 050416
0029 11505 027561
0030 11506 044325
0031 11507 160001
0032 11510 070174
0033 11511 010376
0034 11512 003004
0035 11513 070175
0036 11514 070176
0037 11515 160001
0038 11516 001727
0039 11517 010376
0040 11520 003004
0041 11521 070177
0042 11522 114255
0043 11523 002400
0044 11524 073767
0045 11525 060157
0046 11526 050143
0047 11527 027540
0048 11530 160157
0049 11531 010420
0050 11532 050404
0051 11533 037767
0052 11534 027540
0053 11535 006400
0054 11536 057767
0055 11537 015656
0056 11540 160173
0057 11541 034173

*****
MATRIX STMT EXECUTION CONTROL
*****
EMAT LDA TEMPS,I
      ISZ TEMPS      MAT READ
      AND MSK1       OR
      SZA            MAT PRINT?
      JMP EMAT7      NO
      LDA TEMPS,I    YES
      AND OPMSK      SAVE
      STA MLBX1      TYPE
      CPA RDOP       PRINT?
      RSS            NO
      JSB PRN1A,I    YES

EMAT1 LDA TEMPS,I    LOAD
      AND MSK1      OPERAND
      SZA,RSS       NULL? (END OF MAT PRINT)
      JMP XEC4A,I   YES
      JSB SSYMA,I   NO, SEARCH SYMBOL TABLE
      INB,SZB,RSS   FOUND?
      JMP E0M1A,I   NO
      ISZ TEMPS     YES
      LDA 1,I       SAVE ARRAY
      STA B1        BASE ADDRESS
      LDA MLBX1
      CPA RDOP      READ?
      JMP EMAT5     YES
      ADB .2        NO
      LDA 1,I       SAVE
      STA B1+1      DIMENSIONS
      AND MSK0      SET
      CMA,INA       COLUMN
      STA B2        COUNTERS
      STA B2+1
      LDA 1,I       SET
      ALF,ALF
      AND MSK0      ROW
      CMA,INA
      STA B3        COUNTER
      JSB LCK2A,I   ENSURE ARRAY IS DEFINED
      CLA          SET DELIMITER
      STA MCKS     AS COMMA
      LDA TEMPS    MORE
      CPA PRADD    STATEMENT?
      JMP EMAT3    NO
      LDA TEMPS,I  YES
      AND OPMSK    EXTRACT DELIMITER
      CPA B3000    SEMICOLON?
      ISZ MCKS     YES
      JMP EMAT3
EMAT2 CLB          COMMA
      CPB MCKS     DELIMETER?
      JSB EDELM    YES
EMAT3 LDA B1,I     LOAD
      ISZ B1       NEXT

```

|       |       |        |       |             |                           |
|-------|-------|--------|-------|-------------|---------------------------|
| 0058  | 11542 | 164173 |       | LDB B1,I    | ELEMENT                   |
| 0059  | 11543 | 034173 |       | ISZ B1      |                           |
| 0060  | 11544 | 015643 |       | JSB ENOUT   | OUTPUT IT                 |
| 0061  | 11545 | 034175 |       | ISZ B2      | ROW COMPLETE?             |
| 0062  | 11546 | 027535 |       | JMP EMAT2   | NO                        |
| 0063  | 11547 | 015677 |       | JSB OUTLN   | YES, DO                   |
| 0064  | 11550 | 015677 |       | JSB OUTLN   | SPACING                   |
| 0065  | 11551 | 060176 |       | LDA B2+1    | RESET                     |
| 0066  | 11552 | 070175 |       | STA B2      | COLUMN COUNTER            |
| 0067  | 11553 | 034177 |       | ISZ B3      | ARRAY EXHAUSTED?          |
| 0068  | 11554 | 027540 |       | JMP EMAT3   | NO                        |
| 0069  | 11555 | 064157 | EMAT4 | LDB TEMPS   | YES, MORE                 |
| 0070  | 11556 | 054143 |       | CPB PRADD   | STATEMENT?                |
| 0071  | 11557 | 124256 |       | JMP XEC4A,I | NO                        |
| 0072  | 11560 | 027471 |       | JMP EMAT1   | YES                       |
| 0073* |       |        |       |             |                           |
| 0074  | 11561 | 074175 | EMAT5 | STB B2      | SAVE SYMBOL TABLE POINTER |
| 0075  | 11562 | 160157 |       | LDA TEMPS,I | EXTRACT                   |
| 0076  | 11563 | 010420 |       | AND OPMASK  | NEXT OPERATOR             |
| 0077  | 11564 | 064157 |       | LDB TEMPS   | STATEMENT                 |
| 0078  | 11565 | 054143 |       | CPB PRADD   | EXHAUSTED?                |
| 0079  | 11566 | 002400 |       | CLA         | YES                       |
| 0080  | 11567 | 050412 |       | CPA B2200   | '[' ?                     |
| 0081  | 11570 | 017732 |       | JSB REDIM   | YES, REDIMENSION ARRAY    |
| 0082  | 11571 | 060175 |       | LDA B2      | LOAD                      |
| 0083  | 11572 | 040325 |       | ADA .2      | ARRAY                     |
| 0084  | 11573 | 160000 |       | LDA 0,I     | DIMENSIONS                |
| 0085  | 11574 | 015336 |       | JSB MDIM    | SET                       |
| 0086  | 11575 | 001100 |       | ARS         | ARRAY                     |
| 0087  | 11576 | 003004 |       | CMA,INA     | ELEMENT                   |
| 0088  | 11577 | 070177 |       | STA B3      | COUNTER                   |
| 0089  | 11600 | 114254 | EMAT6 | JSB FDAT,I  | FETCH VALUE               |
| 0090  | 11601 | 170173 |       | STA B1,I    | STORE                     |
| 0091  | 11602 | 034173 |       | ISZ B1      |                           |
| 0092  | 11603 | 174173 |       | STB B1,I    | IT                        |
| 0093  | 11604 | 034173 |       | ISZ B1      |                           |
| 0094  | 11605 | 034177 |       | ISZ B3      | ARRAY EXHAUSTED?          |
| 0095  | 11606 | 027600 |       | JMP EMAT6   | NO                        |
| 0096  | 11607 | 027555 |       | JMP EMAT4   | YES                       |
| 0097* |       |        |       |             |                           |
| 0098  | 11610 | 114231 | EMAT7 | JSB SSYMA,I | SAVE                      |
| 0099  | 11611 | 006004 |       | INB         | BASE ADDRESS              |
| 0100  | 11612 | 160001 |       | LDA 1,I     | OF DESTINATION            |
| 0101  | 11613 | 070177 |       | STA B3      | ARRAY                     |
| 0102  | 11614 | 074175 |       | STB B2      | SAVE SYMBOL TABLE ADDRESS |
| 0103  | 11615 | 044325 |       | ADB .2      | SAVE                      |
| 0104  | 11616 | 160001 |       | LDA 1,I     | ITS                       |
| 0105  | 11617 | 070200 |       | STA B3+1    | DIMENSIONS                |
| 0106  | 11620 | 002404 |       | CLA,INA     | ASSUME MAT                |
| 0107  | 11621 | 071656 |       | STA EDELM   | REPLACEMENT               |
| 0108  | 11622 | 160157 | EMAT8 | LDA TEMPS,I | LOAD NEXT                 |
| 0109  | 11623 | 034157 |       | ISZ TEMPS   | OPERAND                   |
| 0110  | 11624 | 002020 |       | SSA         | ARRAY FUNCTION?           |
| 0111  | 11625 | 027711 |       | JMP EMA11   | YES                       |
| 0112  | 11626 | 010401 | EMAT8 | AND MSK1    | NO                        |
| 0113  | 11627 | 002003 |       | SZA,RSS     | SCALAR MULTIPLICATION?    |

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|       |       |        |                    |                |
|-------|-------|--------|--------------------|----------------|
| 0114  | 11630 | 027701 | JMP EMA10          | YES            |
| 0115  | 11631 | 114231 | JSB SSYMA,I        | NO             |
| 0116  | 11632 | 006004 | INB                | SAVE           |
| 0117  | 11633 | 160001 | LDA 1,I            | BASE           |
| 0118  | 11634 | 070173 | STA B1             | ADDRESS AND    |
| 0119  | 11635 | 044325 | ADB .2             | DIMENSIONS     |
| 0120  | 11636 | 160001 | LDA 1,I            | OF FIRST       |
| 0121  | 11637 | 070174 | STA B1+1           | SOURCE ARRAY   |
| 0122  | 11640 | 064157 | LDB TEMPS          | STATEMENT      |
| 0123  | 11641 | 054143 | CPB PRADD          | EXHAUSTED?     |
| 0124  | 11642 | 027662 | JMP EMAT9          | YES            |
| 0125  | 11643 | 160157 | LDA TEMPS,I        | NO             |
| 0126  | 11644 | 001100 | ARS                | EXTRACT        |
| 0127  | 11645 | 001727 | ALF,ALF            | AND            |
| 0128  | 11646 | 010362 | AND .63            | RECORD         |
| 0129  | 11647 | 040436 | ADA M6             | EMAT           |
| 0130  | 11650 | 071656 | STA EDELM          | OPERATOR       |
| 0131  | 11651 | 160157 | LDA TEMPS,I        | SAVE           |
| 0132  | 11652 | 010401 | AND MSK1           |                |
| 0133  | 11653 | 114231 | JSB SSYMA,I        | BASE ADDRESS   |
| 0134  | 11654 | 006004 | INB                |                |
| 0135  | 11655 | 160001 | LDA 1,I            | AND DIMENSIONS |
| 0136  | 11656 | 070175 | STA B2             |                |
| 0137  | 11657 | 044325 | ADB .2             | OF SECOND      |
| 0138  | 11660 | 160001 | LDA 1,I            |                |
| 0139  | 11661 | 070176 | STA B2+1           | SOURCE ARRAY   |
| 0140* |       |        |                    |                |
| 0141  | 11662 | 061656 | EMAT9 LDA EDELM    | TRANSFER TO    |
| 0142  | 11663 | 043666 | ADA LMAP           | APPROPRIATE    |
| 0143  | 11664 | 114000 | JSB 0,I            | ROUTINE        |
| 0144  | 11665 | 124256 | JMP XEC4A,I        |                |
| 0145* |       |        |                    |                |
| 0146  | 11666 | 111666 | LMAP DEF LBASE-1,I |                |
| 0147  | 11667 | 012123 | LBASE DEF REPLC    |                |
| 0148  | 11670 | 012103 | DEF ADD            |                |
| 0149  | 11671 | 012116 | DEF SUB            |                |
| 0150  | 11672 | 012331 | DEF MULT           |                |
| 0151  | 11673 | 012170 | DEF SZER           |                |
| 0152  | 11674 | 012145 | DEF LCON           |                |
| 0153  | 11675 | 012176 | DEF LIDN           |                |
| 0154  | 11676 | 012441 | DEF LINV           |                |
| 0155  | 11677 | 012266 | DEF TRAN           |                |
| 0156  | 11700 | 012137 | DEF SMULT          |                |
| 0157* |       |        |                    |                |
| 0158  | 11701 | 060334 | EMA10 LDA .10      | SET SMULT      |
| 0159  | 11702 | 071656 | STA EDELM          | OPERATOR       |
| 0160  | 11703 | 114232 | JSB FETCA,I        | EVALUATE       |
| 0161  | 11704 | 070171 | STA MLBX1          | AND SAVE       |
| 0162  | 11705 | 074172 | STB MLBX1+1        | SCALAR         |
| 0163  | 11706 | 034157 | ISZ TEMPS          | GO TO          |
| 0164  | 11707 | 034157 | ISZ TEMPS          | PROCESS        |
| 0165  | 11710 | 027622 | JMP EMAT0          | SOURCE ARRAY   |
| 0166* |       |        |                    |                |
| 0167  | 11711 | 001727 | EMA11 ALF,ALF      | EXTRACT        |
| 0168  | 11712 | 001700 | ALF                |                |
| 0169  | 11713 | 010344 | AND .31            | TYPE           |

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|       |       |        |                 |                |
|-------|-------|--------|-----------------|----------------|
| 0170  | 11714 | 040440 | ADA M8          | RECORD EMAT    |
| 0171  | 11715 | 071656 | STA EDELM       | OPERATOR TYPE  |
| 0172  | 11716 | 040440 | ADA M8          | INV OR         |
| 0173  | 11717 | 002020 | SSA             | TRN?           |
| 0174  | 11720 | 027725 | JMP EMA12       | NO             |
| 0175  | 11721 | 160157 | LDA TEMPS,I     | YES, LOAD      |
| 0176  | 11722 | 034157 | ISZ TEMPS       | SOURCE         |
| 0177  | 11723 | 034157 | ISZ TEMPS       | ARRAY          |
| 0178  | 11724 | 027626 | JMP EMAT6       | SYMBOL         |
| 0179* |       |        |                 |                |
| 0180  | 11725 | 064157 | EMA12 LDB TEMPS | REDIMENSIONING |
| 0181  | 11726 | 054143 | CPB PRADD       | PART?          |
| 0182  | 11727 | 027662 | JMP EMAT9       | NO             |
| 0183  | 11730 | 017732 | JSB REDIM       | YES            |
| 0184  | 11731 | 027662 | JMP EMAT9       |                |

|       |       |        |                                 |                           |
|-------|-------|--------|---------------------------------|---------------------------|
| 0186* |       |        | *****                           |                           |
| 0187* |       |        | SUBROUTINE TO REDIMENSION ARRAY |                           |
| 0188* |       |        | *****                           |                           |
| 0189  | 11732 | 000000 | REDIM NOP                       |                           |
| 0190  | 11733 | 017767 | JSB MCKS                        | EVALUATE                  |
| 0191  | 11734 | 005727 | BLF,BLF                         | AND SAVE                  |
| 0192  | 11735 | 074200 | STB B3+1                        | ROW COUNT                 |
| 0193  | 11736 | 006404 | CLB,INB                         | LOAD DEFAULT COLUMN COUNT |
| 0194  | 11737 | 034157 | ISZ TEMPS                       | SINGLE                    |
| 0195  | 11740 | 160157 | LDA TEMPS,I                     | DIMENSION                 |
| 0196  | 11741 | 010420 | AND OPMSK                       | ARRAY?                    |
| 0197  | 11742 | 050407 | CPA LF                          |                           |
| 0198  | 11743 | 027746 | JMP RED11                       | YES                       |
| 0199  | 11744 | 017767 | JSB MCKS                        | NO, EVALUATE COLUMN COUNT |
| 0200  | 11745 | 034157 | ISZ TEMPS                       | MOVE PAST                 |
| 0201  | 11746 | 034157 | RED11 ISZ TEMPS                 | RIGHT BRACKET             |
| 0202  | 11747 | 044200 | ADB B3+1                        | PACK                      |
| 0203  | 11750 | 074200 | STB B3+1                        | DIMENSIONS                |
| 0204  | 11751 | 060175 | LDA B2                          | STORE IN                  |
| 0205  | 11752 | 040325 | ADA .2                          | SYMBOL                    |
| 0206  | 11753 | 174000 | STB 0,I                         | TABLE                     |
| 0207  | 11754 | 040431 | ADA M1                          | COMPUTE                   |
| 0208  | 11755 | 160000 | LDA 0,I                         | PHYSICAL                  |
| 0209  | 11756 | 015336 | JSB MDIM                        | ARRAY SPACE               |
| 0210  | 11757 | 070172 | STA MLBX1+1                     | SIZE                      |
| 0211  | 11760 | 060200 | LDA B3+1                        | COMPUTE                   |
| 0212  | 11761 | 015336 | JSB MDIM                        | NEW SIZE                  |
| 0213  | 11762 | 003004 | CMA,INA                         | NEW                       |
| 0214  | 11763 | 040172 | ADA MLBX1+1                     | SIZE                      |
| 0215  | 11764 | 002020 | SSA                             | ACCEPTABLE?               |
| 0216  | 11765 | 014477 | JSB ERROR                       | NO                        |
| 0217  | 11766 | 127732 | E7 JMP REDIM,I                  | YES                       |



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0219*
0220*
0221*
0222 11767 000000 MCKS NOP
0223 11770 114232 JSB FETCA,I CALL FOR EVALUATION
0224 11771 015353 JSB SBFIX CONVERT TO INTEGER (ROUNDED)
0225 11772 006004 INB UNBIAS SUBSCRIPT
0226 11773 060001 LDA 1 PUT INTO (A)
0227 11774 040460 ADA M256 LESS THAN
0228 11775 002021 S8A,RS8 256?
0229 11776 124272 JMP E6M1A,I NO
0230 11777 127767 JMP MCKS,I YES, RETURN SUBSCRIPT IN (B)

```

```

0232 12000      ORG 12000B
0233*
0234*****
0235*****      MATRIX      ROUTINES      *****
0236*****
0237*CALL FOR MATRIX OPERATION IS MADE WITH FOUR*
0238*PARAMETERS,ROUTINE NUMBER AND ADDRESS OF  *
0239*SYMBOL TABLE OF THREE MATRICES. FOR SCALAR *
0240*MULT, LAST IS ADDRESS OF SCALAR VALUE      *
0241*OPERATION IS OF FORM B3=B1 OP B2          *
0242*THE ADDRESS OF THE BASE ADDRESS OF MATRICES*
0243*IS GIVEN IN B1,B2,B3. THE DIMENSIONS OF A  *
0244*MATRIX IS GIVEN IN B(1)+1, ROWS IN MOST SIG*
0245*PART(MSP) AND COLUMN IN LEAST SIG PART(LSP)*
0246*****
0247*
0248*
0249*
0250*****
0251***      SUBROUTINE  GENERAL      ***
0252*****
0253*B3=B1 OP B2  SUBROUTINE COMPUTES AN ELEMENT*
0254*OF B3 AND INCREMENTS TO NEXT ELEMENT. THE  *
0255*OPERATION THAT IS PERFORMED AND              *
0256* THE MATRICES INCREMENTED ARE                *
0257* MODIFIED BY ROUTINES ADD, SUB, REPL          *
0258*SCALAR MULT, CON,ZERO,IDN. ROUTINE CHECKS    *
0259*COMPATIBILITY OF THREE MATRICES USING SUB    *
0260*COMPARE (PARAMETERS SUPPLIED IN REG A,B)      *
0261*****
0262*
0263 12000 000000  GENER NOP      SUBROUTINE GENERAL
0264 12001 060176      LDA B2+1  LOAD DIM FOR MATRIX 2
0265 12002 064174      LDB B1+1  LOAD DIM FOR MATRIX 1
0266 12003 016032      JSB COMPR  CHECKS ROW AND COL DIM
0267*                                ARE COMPATIBLE
0268 12004 060174  GEN2  LDA B1+1  LOAD DIM FOR MATRIX 1
0269 12005 064200      LDB B3+1  LOAD DIM FOR MATRIX 3
0270 12006 016032      JSB COMPR  CHECK ROW AND COL DIM
0271 12007 015236      JSB MPY    COLUMNS IN (A)
0272 12010 013115      DEF T3     ROWS IN T3
0273 12011 003004      CMA,INA
0274 12012 073134      STA LPIV   -ROWS*COLUMNS
0275*                                COMPUTES B3=B1 OP B2
0276 12013 160173  LOOP  LDA B1,I  LOAD
0277 12014 034173      ISZ B1      NEXT
0278 12015 164173      LDB B1,I   SOURCE
0279 12016 034173      ISZ B1     ELEMENT
0280 12017 000000  MUL1  NOP      USUALLY A JSB
0281 12020 000000      NOP      USUALLY DEF B2,I
0282 12021 170177      STA B3,I   STORE
0283 12022 034177      ISZ B3     NEXT
0284 12023 174177      STB B3,I   DESTINATION
0285 12024 034177      ISZ B3     ELEMENT
0286 12025 000000  MOD2  NOP      ISZ B2 FOR
0287 12026 000000      NOP      MAT ADD OR SUB

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PAGE 0136 #10 MATRIX ROUTINES

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0288 12027 037134      ISZ LPIV
0289 12030 026013      JMP LOOP      COMPUTE NEXT ELEMENT
0290 12031 126000      JMP GENER,I
0291*
0292*
0293*****
0294****      SUBROUTINE COMPARE      ****
0295*****
0296*ROUTINE COMPARES DIM OF TWO MATRICES GIVEN *
0297*THEIR DIM IN REGISTERS A,B      *
0298*DIMENSIONS ARE GIVEN IN B(1)+2      *
0299*****
0300*
0301 12032 000000      COMPR NOP
0302 12033 050001      CPA 1      EQUAL?
0303 12034 002001      RSS      YES
0304 12035 014477      LEER JSB ERROR      NO
0305 12036 001727      ALF,ALF      SAVE
0306 12037 010376      AND MSK0      # OF
0307 12040 073115      STA T3      ROWS
0308 12041 060001      LDA 1
0309 12042 010376      AND MSK0      SAVE #
0310 12043 073116      STA T4      OF COLUMNS
0311 12044 126032      JMP COMPR,I
0312*
0313*
0314*****
0315*****      SUBROUTINE LCHK      *****
0316*****
0317*TESTS THAT NO ELEMENT IN A MATRIX IS      *
0318*UNASSIGNED. ENTRY1 CHECKS MATRICES GIVEN BY*
0319*B1 AND B2 AND ENTRY 2 CHECKS ONLY B1      *
0320*****
0321*
0322 12045 000000      LCHK2 NOP
0323 12046 062045      LDA LCHK2
0324 12047 072051      STA LCHK1
0325 12050 026055      JMP ++5
0326 12051 000000      LCHK1 NOP
0327 12052 064175      LDB B2      BASE ADDR
0328 12053 060176      LDA B2+1      ROW AND COL DIM.
0329 12054 016061      JSB LCHK4      TEST EACH TERM OF B2
0330 12055 064173      LDB B1      BASE ADDR
0331 12056 060174      LDA B1+1      ROW AND COL DIM.
0332 12057 016061      JSB LCHK4      TEST EACH TERM OF B1
0333 12060 126051      JMP LCHK1,I
0334*
0335 12061 000000      LCHK4 NOP      SUBROUTINE TO TEST TERMS
0336 12062 077120      STB T6      SAVE
0337 12063 015336      JSB MDIM      COMPUTE SIZE OF MATRIX
0338 12064 001100      ARS      SET NEGATIVE
0339 12065 003004      CMA,INA
0340 12066 073121      STA T7      COUNTER FOR ELEMENTS
0341 12067 163120      LCHK6 LDA T6,I      LOAD
0342 12070 037120      ISZ T6
0343 12071 167120      LDB T6,I      ELEMENT

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0344 12072 037120      ISZ T6
0345 12073 050470      CPA MNEG      COMPARE WITH PRESET QTY.
0346 12074 026076      JMP **2
0347 12075 026100      JMP LCHK5
0348 12076 054471      CPB MNEG+1
0349 12077 014477      JSB ERROR      ERROR 'MAT UNASSIGNED'
0350 12100 037121      LCHK5 ISZ T7      DONE?
0351 12101 026067      JMP LCHK6      NO
0352 12102 126061      JMP LCHK4,I     YES
0353*
0354*
0355*****
0356**** SUBROUTINE MATRIX ADD ****
0357*****
0358*B1,B2,B3 CONTAIN ADDRESS OF BASE ADDRESS OF*
0359*THREE MATRICES. ROUTINE EXECUTES B3=B1+B2 *
0360*BY MODIFYING INSTR IN ROUTINE GENERAL *
0361*****
0362*
0363 12103 000000      ADD NOP
0364 12104 063135      LDA LPLUS      JSB .FAD
0365 12105 072017      ADD1 STA MOD1      SET IN GENER
0366 12106 063136      LDA LPLUS+1    DEF OF B2,I
0367 12107 072020      STA MOD1+1    MODIFY ROUTINE GENERAL
0368 12110 063141      LDA INCB2      ISZ B2
0369 12111 072025      STA MOD2
0370 12112 072026      STA MOD2+1
0371 12113 016051      JSB LCHK1      TEST B1,B2 FOR UNASSIGNED TERMS
0372 12114 016000      JSB GENER      ROUTINE GENERAL
0373 12115 126103      JMP ADD,I      EXIT TO MAIN PROGRAM
0374*
0375*
0376*****
0377**** SUBROUTINE MATRIX SUBTRACT ****
0378*****
0379*B1,B2,B3 CONTAIN ADDRESS OF BASE ADDRESS OF*
0380*THREE MATRICES. ROUTINE EXECUTES B3=B1-B2 *
0381*BY MODIFYING INSTR IN ROUTINE GENERAL *
0382*****
0383*
0384 12116 000000      SUB NOP      LET
0385 12117 062116      LDA SUB      ADD DO
0386 12120 072103      STA ADD      RETURN
0387 12121 063137      LDA LMIN      JSB .FSB
0388 12122 026105      JMP ADD1

```

0390\*

0391\*\*\*\*\*

0392\*\*\* SUBROUTINE MATRIX REPLACE \*\*\*\*

0393\*\*\*\*\*

0394\*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN\*

0395\*MATRIX AND RECEIVING MATRIX RESPECTIVELY \*

0396\*\*\*\*\*

|      |       |        |       |          |                                 |
|------|-------|--------|-------|----------|---------------------------------|
| 0397 | 12123 | 000000 | REPLC | NOP      | LET                             |
| 0398 | 12124 | 062123 | LDA   | REPLC    | GENER DO                        |
| 0399 | 12125 | 072000 | STA   | GENER    | RETURN                          |
| 0400 | 12126 | 002400 | CLA   |          | NO                              |
| 0401 | 12127 | 006400 | CLB   |          | OPERATION                       |
| 0402 | 12130 | 072017 | REPL1 | STA MOD1 | SET                             |
| 0403 | 12131 | 076020 | STB   | MOD1+1   | OPERATION                       |
| 0404 | 12132 | 002400 | CLA   |          | B2                              |
| 0405 | 12133 | 072025 | STA   | MOD2     | NOT                             |
| 0406 | 12134 | 072026 | STA   | MOD2+1   | USED                            |
| 0407 | 12135 | 016045 | JSB   | LCHK2    | TEST B1 FOR UNASSIGNED ELEMENTS |
| 0408 | 12136 | 026004 | JMP   | GEN2     |                                 |

0409\*

0410\*

0411\*\*\*\*\*

0412\*\*\* SUBROUTINE MATRIX SCALAR MULT \*\*\*\*

0413\*\*\*\*\*

0414\*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN\*

0415\*MATRIX AND RECEIVING MATRIX RESPECTIVELY \*

0416\*MBXL HOLDS ADDRESS OF SCALAR VALUE \*

0417\*\*\*\*\*

0418\*

|      |       |        |       |       |          |
|------|-------|--------|-------|-------|----------|
| 0419 | 12137 | 000000 | SMULT | NOP   | LET      |
| 0420 | 12140 | 062137 | LDA   | SMULT | GENER DO |
| 0421 | 12141 | 072000 | STA   | GENER | RETURN   |
| 0422 | 12142 | 063140 | LDA   | LTIME | SET FOR  |
| 0423 | 12143 | 064323 | LDB   | MBXL  | MULTIPLY |
| 0424 | 12144 | 026130 | JMP   | REPL1 |          |

0425\*

0426\*

0427\*\*\*\*\*

0428\*\*\* SUBROUTINE MATRIX CON \*\*\*\*

0429\*\*\*\*\*

0430\*SETS MATRIX TO ALL ONES. B3 IS ADDRESS OF \*

0431\*BASE ADDRESS OF MATRIX. \*

0432\*\*\*\*\*

0433\*

|      |       |        |         |           |          |
|------|-------|--------|---------|-----------|----------|
| 0434 | 12145 | 000000 | LCON    | NOP       |          |
| 0435 | 12146 | 060466 | LDA     | HONE      |          |
| 0436 | 12147 | 064325 | LDB     | .2        |          |
| 0437 | 12150 | 070171 | LCCN1   | STA MLBX1 | SET      |
| 0438 | 12151 | 074172 | STB     | MLBX1+1   | CONSTANT |
| 0439 | 12152 | 060200 | LDA     | B3+1      |          |
| 0440 | 12153 | 015336 | JSB     | MDIM      | SET      |
| 0441 | 12154 | 001100 | ARS     |           | ELEMENT  |
| 0442 | 12155 | 003004 | CMA,INA |           | COUNTER  |
| 0443 | 12156 | 073134 | STA     | LPIV      |          |
| 0444 | 12157 | 060171 | LDA     | MLBX1     | LOAD     |
| 0445 | 12160 | 064172 | LDB     | MLBX1+1   | CONSTANT |

PAGE 0139 #10 MATRIX ROUTINES

```

0446 12161 170177 LCCN2 STA B3,I      STORE
0447 12162 034177      ISZ B3      IN
0448 12163 174177      STB B3,I      NEXT
0449 12164 034177      ISZ B3      ELEMENT
0450 12165 037134      ISZ LPIV     DONE?
0451 12166 026161      JMP LCON2     NO
0452 12167 126145      JMP LCON,I    YES
0453*
0454*
0455*****
0456***      SUBROUTINE MATRIX ZERO      ****
0457*****
0458*SETS MATRIX TO ZERO. B3 IS ADDRESS OF BASE *
0459*ADDRESS OF MATRIX. B1,B2 ARE REDUNDANT *
0460*SET B1=0 AND USE SUBROUTINE CON,ENTRY2 *
0461*****
0462*
0463 12170 000000 SZER NOP
0464 12171 062170      LDA SZER      CONVERT
0465 12172 072145      STA LCON
0466 12173 002400      CLA      LCON
0467 12174 006400      CLB
0468 12175 026150      JMP LCON1      TO SZER
0469*
0470*
0471*****
0472***      SUBROUTINE MATRIX IDN      ****
0473*****
0474*ROUTINE SETS UP IDENTITY MATRIX *
0475*B3 IS ADDRESS OF BASE ADDRESS OF MATRIX *
0476*USE SZER TO SET MATRIX TO ALL ZEROS. ON *
0477*RETURN CHECK FOR SQUARE MATRIX. *
0478*****
0479*
0480 12176 000000 LIDN NOP
0481 12177 060177      LDA B3
0482 12200 073123      STA T9      SAVE BASE ADDRESS
0483 12201 016170      JSB SZER     SET ALL MATRIX TO ZERO
0484 12202 060200      LDA B3+1     IS
0485 12203 001727      ALF,ALF      ARRAY
0486 12204 050200      CPA B3+1      SQUARE?
0487 12205 001010      ALS,SLA      YES
0488 12206 026035      JMP LERR      NO
0489 12207 010401      AND MSK1     SAVE ROW
0490 12210 070171      STA MLBX1    LENGTH
0491 12211 001100      ARS      SAVE
0492 12212 003004      CMA,INA      ROW
0493 12213 070172      STA MLBX1+1  COUNTER
0494 12214 067123      LDB T9      RESTORE
0495 12215 074177      STB B3      B3
0496 12216 060466 LIDN1 LDA HONE     STORE
0497 12217 170001      STA 1,I
0498 12220 006004      INB      1.0 ON
0499 12221 060325      LDA .2
0500 12222 170001      STA 1,I      DIAGONAL
0501 12223 006004      INB

```

```

0502 12224 044171      ADB MLBX1      MOVE TO NEXT DIAGONAL ELEMENT
0503 12225 034172      ISZ MLBX1+1    DONE?
0504 12226 026216      JMP LIDN1      NO
0505 12227 126176      JMP LIDN,I    YES
0506*
0507*
0508*****
0509*****      SUBROUTINES DLD AND DST      *****
0510*****
0511*
0512*
0513*
0514 12230 000000      .DLD  NOP
0515 12231 016250      JSB GETAD      GET ADDRESS
0516 12232 112230      DEF .DLD,I
0517 12233 036230      ISZ .DLD      BUMP RETURN ADDRESS
0518 12234 162264      LDA ADRES,I    LOAD HIGH PART.
0519 12235 036264      ISZ ADRES
0520 12236 166264      LDB ADRES,I    LOAD LOW PART.
0521 12237 126230      JMP .DLD,I
0522*
0523 12240 000000      .DST  NOP
0524 12241 016250      JSB GETAD      GET ADDRESS.
0525 12242 112240      DEF .DST,I
0526 12243 036240      ISZ .DST      BUMP RETURN ADDRESS.
0527 12244 172264      STA ADRES,I    STORE HIGH PART.
0528 12245 036264      ISZ ADRES
0529 12246 176264      STB ADRES,I    STORE LOW PART.
0530 12247 126240      JMP .DST,I
0531*
0532 12250 000000      GETAD NOP      COMPUTES EFFECTIVE ADDRESS.
0533 12251 072265      STA TINY      SAVE A REGISTER.
0534 12252 162250      LDA GETAD,I    GET POINTER TO ADDRESS.
0535 12253 072264      GET  STA ADRES      STORE IN ADRES.
0536 12254 062265      LDA TINY      RESTORE A REGISTER.
0537 12255 162264      LDA ADRES,I
0538 12256 001275      RAL,CLE,SLA,ERA  TEST FOR INDIRECT
0539 12257 026253      JMP GET      IT IS INDIRECT.
0540 12260 072264      STA ADRES      EFFECTIVE ADDRESS.
0541 12261 062265      LDA TINY
0542 12262 036250      ISZ GETAD      RETURN
0543 12263 126250      JMP GETAD,I
0544 12264 000000      ADRES BSS 1
0545 12265 000000      TINY  BSS 1

```

0547\*

0548\*\*\*\*\*

0549\*\*\*\*\* SUBROUTINE TRANSPOSE \*\*\*\*\*

0550\*\*\*\*\*

0551\*TRANSPOSE OF FORM  $B3(M,N)=T(B1(N,M))$  \*

0552\*B1,B3 GIVE ADDRESS OF BASE ADDRESS OF GIVEN\*

0553\*AND RECEIVING MATRICES RESPECTIVELY. \*

0554\*\*\*\*\*

0555\*

0556 12266 000000 TRAN NOP

0557 12267 016045 JSB LCHK2

0558\*

0559 12270 060200 LDA B3+1

0560 12271 001727 ALF,ALF

0561 12272 064174 LDB B1+1

0562 12273 016032 JSB COMPR

0563\*

0564 12274 015236 JSB MPY

0565 12275 013115 DEF T3

0566 12276 073134 STA LPIV

0567 12277 063116 LDA T4

0568 12300 003004 CMA,INA

0569 12301 073117 STA T5

0570\*

0571\*

0572\*

0573 12302 002400 TRAN1 CLA

0574 12303 073120 STA T6

0575 12304 067120 LNEXT LDB T6

0576 12305 005000 BLS

0577 12306 044173 ADB B1

0578 12307 160001 LDA 1,I

0579 12310 006004 INB

0580 12311 164001 LDB 1,I

0581 12312 170177 STA B3,I

0582 12313 034177 ISZ B3

0583 12314 174177 STB B3,I

0584 12315 034177 ISZ B3

0585 12316 063120 LDA T6

0586 12317 043116 ADA T4

0587 12320 073120 STA T6

0588 12321 053134 CPA LPIV

0589 12322 026324 JMP \*\*2

0590 12323 026304 JMP LNEXT

0591\*

0592\*

0593 12324 034173 ISZ B1

0594 12325 034173 ISZ B1

0595 12326 037117 ISZ T5

0596 12327 026302 JMP TRAN1

0597 12330 126266 JMP TRAN,I

TEST B1 FOR UNASSIGNED TERMS

CHECK DIMENSIONS

PARAMETERS OF B3

INTERCHANGE ROW AND COLUMN

PARAMETERS OF B1

SUBROUTINE COMPARE

DIMENSIONS COMPATIBLE

# OF COLUMNS IN (A)

# OF ROWS IN T3

PRODUCT OF ROW\*COL

SET

COLUMN

COUNTER

T6 IS INDICATOR TO SELECT

WHICH ELEMENT IN A COL OF

B1 IS TO BE TRANSPOSED

SET T6=0

LOAD

NEXT ELEMENT

OF COLUMN

STORE

IN

ROW

SET T6=T6+T4

T6 POINTS TO NEXT TERM IN

A COLUMN TO BE TRANSPOSED

TEST FOR LAST IN COL

SET BASE ADDRESS TO FIRST

TERM IN NEXT COLUMN

TRANSPOSE NEXT COL

EXIT TO MAIN PROGRAM



```

0002*
0003*****
0004***      SUBROUTINE  MATRIX  MULT      ****
0005*****
0006*ROUTINE IS OF FORM B3(M,P)=B1(M,N)*B2(N,P) *
0007*B1,B2,B3 ARE ADDRESSES OF BASE ADDRESSES OF*
0008*THREE MATRICES                               *
0009*****
0010*
0011  12331  000000  MULT  NOP
0012  12332  016051          JSB  LCHK1      TEST B1,B2 FOR UNASSIGNED TERMS
0013*                                     CHECK DIMENSIONS
0014  12333  060200          LDA  B3+1      PARAMETERS OF B3
0015  12334  010376          AND  MSK0      SAVE COLUMN COUNT
0016  12335  073120          STA  T6
0017  12336  060176          LDA  B2+1      PARAMETERS OF B2
0018  12337  010376          AND  MSK0
0019  12340  053120          CPA  T6        COLUMNS EQUAL
0020  12341  002001          RSS          IN NUMBER?
0021  12342  026035          JMP  LERR      NO
0022*                                     COMBINE B3,B2 PARAMETERS
0023*                                     INTO (M,N) AND COMPARE
0024*                                     WITH THOSE OF B1
0025  12343  060200          LDA  B3+1      PARAMETERS OF B3
0026  12344  010460          AND  M256
0027  12345  070001          STA  1        STORE ROW IN MSP OF B
0028  12346  060176          LDA  B2+1      PARAMETERS OF B2
0029  12347  001727          ALF,ALF      GET ROW COUNT
0030  12350  010376          AND  MSK0      IN (A)
0031  12351  040001          ADA  1        COMBINE A AND B
0032  12352  064174          LDB  B1+1      PARAMETERS OF B1
0033  12353  016032          JSB  COMPR     COMPARE ROW AND COL
0034*                                     DIMENSIONS ARE COMPATIBLE
0035*                                     M,N ARE STORED IN T3,T4
0036*                                     SAVE B2 AS DESTROYED IN
0037  12354  060175          LDA  B2        MULT
0038  12355  073117          STA  T5
0039  12356  063115          LDA  T3        SET
0040  12357  003004          CMA,INA      ROW
0041  12360  073123          STA  T9        COUNTER
0042  12361  063120  MULT4  LDA  T6
0043  12362  003004          CMA,INA
0044  12363  073124          STA  T10      SET COUNTER
0045  12364  063117          LDA  T5
0046  12365  070175          STA  B2      RESTORE BASE ADDRESS B2
0047  12366  002400  MULT3  CLA
0048  12367  073125          STA  T11      COUNTER FOR B2. INCR BY
0049*                                     2*P AND POINTS TO NEXT TERM
0050*                                     IN COL TO BE MULTIPLIED
0051  12370  073126          STA  T12      COUNTER FOR B1. INCR BY 2
0052*                                     AND POINTS TO NEXT TERM
0053*                                     IN ROW TO BE MULTIPLIED
0054  12371  006400          CLB
0055  12372  016240          JSB  .DST      CLEAR TO ZERO
0056  12373  100177          DEF  B3,I
0057  12374  064173  MULT2  LDB  B1      COMPUTE PROD OF ONE TERM

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|       |       |        |             |                           |
|-------|-------|--------|-------------|---------------------------|
| 0058  | 12375 | 047126 | ADB T12     | IN ROW BY ONE TERM IN COL |
| 0059  | 12376 | 077132 | STB T18     |                           |
| 0060  | 12377 | 064175 | LDB B2      |                           |
| 0061  | 12400 | 047125 | ADB T11     |                           |
| 0062  | 12401 | 016230 | JSB .DLD    |                           |
| 0063  | 12402 | 100001 | DEF 1,I     |                           |
| 0064  | 12403 | 114240 | JSB .FMPA,I |                           |
| 0065  | 12404 | 113132 | DEF T18,I   |                           |
| 0066  | 12405 | 114236 | JSB .FADA,I | COMPUTES RUNNING SUM      |
| 0067  | 12406 | 100177 | DEF B3,I    |                           |
| 0068  | 12407 | 016240 | JSB .DST    |                           |
| 0069  | 12410 | 100177 | DEF B3,I    |                           |
| 0070  | 12411 | 037126 | ISZ T12     | SELECT NEXT TERM IN ROW   |
| 0071  | 12412 | 037126 | ISZ T12     |                           |
| 0072  | 12413 | 063120 | LDA T6      | SELECT NEXT TERM IN COL   |
| 0073  | 12414 | 001000 | ALS         |                           |
| 0074  | 12415 | 043125 | ADA T11     |                           |
| 0075  | 12416 | 073125 | STA T11     |                           |
| 0076* |       |        |             | TEST IF HAVE MULT ONE ROW |
| 0077* |       |        |             | BY ONE COLUMN             |
| 0078  | 12417 | 063116 | LDA T4      |                           |
| 0079  | 12420 | 001000 | ALS         |                           |
| 0080  | 12421 | 053126 | CPA T12     |                           |
| 0081  | 12422 | 026424 | JMP **2     |                           |
| 0082  | 12423 | 026374 | JMP MULT2   | MULT AND ADD IN NEXT TERM |
| 0083* |       |        |             | SUMMATION OF PRODUCTS FOR |
| 0084* |       |        |             | ONE TERM OF B3 IS DONE    |
| 0085* |       |        |             | MULT SAME ROW BY NEXT COL |
| 0086  | 12424 | 034177 | ISZ B3      | INCR RECEIVING MAT        |
| 0087  | 12425 | 034177 | ISZ B3      |                           |
| 0088  | 12426 | 034175 | ISZ B2      | BASE ADDRESS OF NEXT COL  |
| 0089  | 12427 | 034175 | ISZ B2      |                           |
| 0090* |       |        |             | TEST IF HAVE MULT ONE ROW |
| 0091* |       |        |             | BY ALL COLUMNS            |
| 0092  | 12430 | 037124 | ISZ T10     | SKIP IF INNERPRODUCT DONE |
| 0093  | 12431 | 026366 | JMP MULT3   | COMPUTE SAME ROW*NEXT COL |
| 0094* |       |        |             | SELECT NEXT ROW           |
| 0095  | 12432 | 063116 | LDA T4      |                           |
| 0096  | 12433 | 001000 | ALS         |                           |
| 0097  | 12434 | 040173 | ADA B1      |                           |
| 0098  | 12435 | 070173 | STA B1      | ADDRESS OF NEXT ROW       |
| 0099  | 12436 | 037123 | ISZ T9      |                           |
| 0100  | 12437 | 026361 | JMP MULT4   | MULT ROW BY ALL COLUMNS   |
| 0101  | 12440 | 126331 | JMP MULT,I  | EXIT TO MAIN PROGRAM      |

PAGE 0144 #11 MATRIX ROUTINES

0103\*

0104\*\*\*\*\*

0105\*\*\*\* SUBROUTINE MATRIX INVERT \*\*\*\*

0106\*\*\*\*\*

0107\*OPERATION OF FORM MAT B3 = INV B1 \*

0108\*B1,B3 ARE ADDRESSES OF BASE ADDRESS OF \*

0109\*MATRIX TO BE INVERTED AND RECEIVING MATRIX \*

0110\*RESPECTIVELY. B2 IS REDUNDANT. METHOD USED \*

0111\*IS GAUSSIAN ELIMINATION WITH COLUMN \*

0112\*PIVOTING \*

0113\*\*\*\*\*

0114\*

|       |       |        |       |           |                              |
|-------|-------|--------|-------|-----------|------------------------------|
| 0115  | 12441 | 000000 | LIN V | NOP       | SUBROUTINE MATRIX INVERT     |
| 0116  | 12442 | 016045 |       | JSB LCHK2 | TEST B1 FOR UNASSIGNED TERMS |
| 0117  | 12443 | 060174 |       | LDA B1+1  | DIMENSIONS OF MATRIX B1      |
| 0118  | 12444 | 064200 |       | LDB B3+1  | DIMENSIONS OF MATRIX B3      |
| 0119  | 12445 | 016032 |       | JSB COMPR | CHECK DIMENSIONS             |
| 0120* |       |        |       |           | ROW AND COL VALUES T3,T4     |
| 0121* |       |        |       |           | MAKE COPY OF MATRIX B1       |
| 0122* |       |        |       |           | IN FREE CORE                 |
| 0123  | 12446 | 060177 |       | LDA B3    | SAVE                         |
| 0124  | 12447 | 073127 |       | STA T13   | B3                           |
| 0125  | 12450 | 060174 |       | LDA B1+1  | COMPUTE SIZE                 |
| 0126  | 12451 | 015336 |       | JSB MDIM  | OF MATRIX                    |
| 0127  | 12452 | 003004 |       | CMA,INA   |                              |
| 0128  | 12453 | 001100 |       | ARS       | SAVE                         |
| 0129  | 12454 | 073114 |       | STA T2    | ELEMENT                      |
| 0130  | 12455 | 001000 |       | ALS       | COUNTER                      |
| 0131  | 12456 | 064141 |       | LDB LSTPT | SAVE                         |
| 0132  | 12457 | 006004 |       | INB       | ADDRESS OF                   |
| 0133  | 12460 | 074175 |       | STB B2    | FREE CORE                    |
| 0134  | 12461 | 074177 |       | STB B3    |                              |
| 0135  | 12462 | 007004 |       | CMB,INB   | COMPUTE SIZE OF              |
| 0136  | 12463 | 044142 |       | ADB HSTPT | FREE CORE AREA               |
| 0137  | 12464 | 040001 |       | ADA 1     | ENOUGH                       |
| 0138  | 12465 | 002020 |       | SSA       | CORE LEFT?                   |
| 0139  | 12466 | 025473 |       | JMP E1    | NO                           |
| 0140  | 12467 | 016123 |       | JSB REPLC | YES, COPY SOURCE MATRIX      |
| 0141  | 12470 | 063127 |       | LDA T13   | RESTORE                      |
| 0142  | 12471 | 070177 |       | STA B3    | B3                           |
| 0143  | 12472 | 016176 |       | JSB LIDN  | SET DESTINATION TO IDENTITY  |
| 0144  | 12473 | 063127 |       | LDA T13   | RESTORE ITS                  |
| 0145  | 12474 | 070177 |       | STA B3    | BASE ADDRESS                 |
| 0146  | 12475 | 002400 |       | CLA       | INITIALIZE                   |
| 0147  | 12476 | 073126 |       | STA T12   | MAXIMUM                      |
| 0148  | 12477 | 073127 |       | STA T13   | ELEMENT                      |
| 0149  | 12500 | 060175 |       | LDA B2    | COPY B2 INTO B1 AS           |
| 0150  | 12501 | 070173 |       | STA B1    | B2 NEEDED LATER              |
| 0151  | 12502 | 160173 | LIN11 | LDA B1,I  | LOAD                         |
| 0152  | 12503 | 034173 |       | ISZ B1    | NEXT                         |
| 0153  | 12504 | 164173 |       | LDB B1,I  | ELEMENT                      |
| 0154  | 12505 | 034173 |       | ISZ B1    |                              |
| 0155  | 12506 | 002020 |       | SSA       | GET ABSOLUTE VALUE           |
| 0156  | 12507 | 015423 |       | JSB ARINV | IF NUMBER IS NEGATIVE        |
| 0157  | 12510 | 073132 |       | STA T18   | SAVE NUMBER                  |
| 0158  | 12511 | 077133 |       | STB T19   |                              |

PAGE 0145 #11 MATRIX ROUTINES

|       |       |        |                |                              |
|-------|-------|--------|----------------|------------------------------|
| 0159  | 12512 | 114237 | JSB .FSBA,I    | SUBTRACT EXISTING MAX.       |
| 0160  | 12513 | 013126 | DEF T12        | VALUE                        |
| 0161  | 12514 | 002020 | SSA            | SKIP AND SWAP IF POSITIVE    |
| 0162  | 12515 | 026522 | JMP LIN10      |                              |
| 0163  | 12516 | 063132 | LDA T18        | SWAP                         |
| 0164  | 12517 | 067133 | LDB T19        |                              |
| 0165  | 12520 | 073126 | STA T12        |                              |
| 0166  | 12521 | 077127 | STB T13        |                              |
| 0167  | 12522 | 037114 | LIN10 ISZ T2   | ALL ELEMENTS EXHAUSTED?      |
| 0168  | 12523 | 026502 | JMP LIN11      | NO                           |
| 0169  | 12524 | 063126 | LDA T12        | COMPUTE RELATIVE TOLERANCE   |
| 0170  | 12525 | 067127 | LDB T13        | TOL=ABSOLUTE TOL * MAX VALUE |
| 0171  | 12526 | 114240 | JSB .FMFA,I    |                              |
| 0172  | 12527 | 013130 | DEF T16        | ABSOLUTE TOLERANCE           |
| 0173  | 12530 | 070171 | STA MLBX1      | RELATIVE                     |
| 0174  | 12531 | 074172 | STB MLBX1+1    | TOLERANCE                    |
| 0175  | 12532 | 002400 | CLA            | INITIALIZE PIVOT             |
| 0176  | 12533 | 073134 | STA LPIV       |                              |
| 0177  | 12534 | 037116 | ISZ T4         | REQUIRE CONSTANT (ROW+1)     |
| 0178  | 12535 | 037134 | LIN11 ISZ LPIV | SELECT NEXT PIVOT            |
| 0179  | 12536 | 063134 | LDA LPIV       | TEST IF HAVE PROCESSED       |
| 0180  | 12537 | 053116 | CPA T4         | LAST PIVOT                   |
| 0181  | 12540 | 126441 | JMP LINV,I     | NORMAL EXIT TO MAIN PROG     |
| 0182* |       |        |                | SCAN PIVOTAL COLUMN FOR      |
| 0183* |       |        |                | LARGEST ELEMENT              |
| 0184  | 12541 | 063134 | LDA LPIV       | COMPUTE ADDRESS OF PIVOT     |
| 0185  | 12542 | 067134 | LDB LPIV       | COLUMN USING ROUTINE LWHR    |
| 0186  | 12543 | 073114 | STA T2         | ROW COUNTER                  |
| 0187  | 12544 | 017067 | JSB LWHR       | ON RETURN, ADDRESS IN A      |
| 0188  | 12545 | 073113 | STA T1         |                              |
| 0189  | 12546 | 002400 | CLA            |                              |
| 0190  | 12547 | 073126 | STA T12        | T12,T13 IS STORE             |
| 0191  | 12550 | 073127 | STA T13        | FOR GREATEST VALUE           |
| 0192  | 12551 | 016230 | LIN12 JSB .OLD | LOAD FP NUMBER               |
| 0193  | 12552 | 113113 | DEF T1,I       |                              |
| 0194  | 12553 | 002020 | SSA            | OBTAIN ABSOLUTE VALUE        |
| 0195  | 12554 | 015423 | JSB ARINV      | IF NUMBER IS NEGATIVE        |
| 0196  | 12555 | 073132 | STA T18        | STORE VALUE OF FP NUMBER     |
| 0197  | 12556 | 077133 | STB T19        |                              |
| 0198  | 12557 | 114237 | JSB .FSBA,I    | SUBTR EXISTING LARGEST VALUE |
| 0199  | 12560 | 013126 | DEF T12        |                              |
| 0200  | 12561 | 002020 | SSA            | SKIP AND SWAP IF POSITIVE    |
| 0201  | 12562 | 026571 | JMP LINV7      | T2 STILL CONTAINS MAX VALUE  |
| 0202  | 12563 | 063132 | LDA T18        | STORE NEW MAX VALUE          |
| 0203  | 12564 | 067133 | LDB T19        |                              |
| 0204  | 12565 | 073126 | STA T12        |                              |
| 0205  | 12566 | 077127 | STB T13        |                              |
| 0206  | 12567 | 063114 | LDA T2         | SET T5 TO POSITION IN        |
| 0207  | 12570 | 073117 | STA T5         | COLUMN OF MAX VALUE          |
| 0208  | 12571 | 037114 | LIN13 ISZ T2   |                              |
| 0209  | 12572 | 063114 | LDA T2         | TEST FOR LAST TERM IN COL    |
| 0210  | 12573 | 053116 | CPA T4         |                              |
| 0211  | 12574 | 026602 | JMP LINV8      | SWAP ROWS                    |
| 0212  | 12575 | 063115 | LDA T3         | COMPUTE                      |
| 0213  | 12576 | 001000 | ALS            | NEXT ADDRESS                 |
| 0214  | 12577 | 043113 | ADA T1         | IN PIVOT                     |

|       |       |        |       |            |                            |
|-------|-------|--------|-------|------------|----------------------------|
| 0215  | 12600 | 073113 |       | STA T1     | COLUMN                     |
| 0216  | 12601 | 026551 |       | JMP LINV2  | SELECT NEXT TERM           |
| 0217* |       |        |       |            | SWAP ROWS LPIV AND T5      |
| 0218  | 12602 | 063134 | LINV8 | LDA LPIV   | COMPUTE ADDRESS            |
| 0219  | 12603 | 006404 |       | CLB, INB   | OF PIVOTAL ROW             |
| 0220  | 12604 | 017067 |       | JSB LWHR   |                            |
| 0221  | 12605 | 073113 |       | STA T1     | ADDRESS OF PIVOTAL ROW     |
| 0222  | 12606 | 063117 |       | LDA T5     |                            |
| 0223  | 12607 | 006404 |       | CLB, INB   |                            |
| 0224  | 12610 | 017067 |       | JSB LWHR   |                            |
| 0225  | 12611 | 073114 |       | STA T2     | ADDR OF ROW TO BE SWAPPED  |
| 0226  | 12612 | 063134 |       | LDA LPIV   |                            |
| 0227  | 12613 | 006404 |       | CLB, INB   | COMPUTE ADDRESS OF         |
| 0228  | 12614 | 017101 |       | JSB LWHR2  | PIVOTAL ROW IN I-MATRIX    |
| 0229  | 12615 | 073123 |       | STA T9     |                            |
| 0230  | 12616 | 073124 |       | STA T10    | KEEP COPY                  |
| 0231  | 12617 | 063117 |       | LDA T5     |                            |
| 0232  | 12620 | 006404 |       | CLB, INB   | COMPUTE ADDR OF ROW TO     |
| 0233  | 12621 | 017101 |       | JSB LWHR2  | BE SWAPPED IN I-MATRIX     |
| 0234  | 12622 | 073125 |       | STA T11    |                            |
| 0235  | 12623 | 063115 |       | LDA T3     |                            |
| 0236  | 12624 | 003004 |       | CMA, INA   |                            |
| 0237  | 12625 | 073126 |       | STA T12    | COUNTER FOR TERMS IN A ROW |
| 0238  | 12626 | 016230 | LINV3 | JSB .DLD   | SWAP ONE ELEMENT OF ROW    |
| 0239  | 12627 | 113113 |       | DEF T1, I  |                            |
| 0240  | 12630 | 073132 |       | STA T18    |                            |
| 0241  | 12631 | 077133 |       | STB T19    |                            |
| 0242  | 12632 | 016230 |       | JSB .DLD   |                            |
| 0243  | 12633 | 113114 |       | DEF T2, I  |                            |
| 0244  | 12634 | 173113 |       | STA T1, I  |                            |
| 0245  | 12635 | 037113 |       | ISZ T1     |                            |
| 0246  | 12636 | 177113 |       | STB T1, I  |                            |
| 0247  | 12637 | 037113 |       | ISZ T1     |                            |
| 0248  | 12640 | 063132 |       | LDA T18    |                            |
| 0249  | 12641 | 067133 |       | LDB T19    |                            |
| 0250  | 12642 | 173114 |       | STA T2, I  |                            |
| 0251  | 12643 | 037114 |       | ISZ T2     |                            |
| 0252  | 12644 | 177114 |       | STB T2, I  |                            |
| 0253  | 12645 | 037114 |       | ISZ T2     |                            |
| 0254  | 12646 | 016230 |       | JSB .DLD   | SWAP ONE ELEMENT IN A ROW  |
| 0255  | 12647 | 113123 |       | DEF T9, I  | OF I-MATRIX                |
| 0256  | 12650 | 073132 |       | STA T18    |                            |
| 0257  | 12651 | 077133 |       | STB T19    |                            |
| 0258  | 12652 | 016230 |       | JSB .DLD   |                            |
| 0259  | 12653 | 113125 |       | DEF T11, I |                            |
| 0260  | 12654 | 173123 |       | STA T9, I  |                            |
| 0261  | 12655 | 037123 |       | ISZ T9     |                            |
| 0262  | 12656 | 177123 |       | STB T9, I  |                            |
| 0263  | 12657 | 037123 |       | ISZ T9     |                            |
| 0264  | 12660 | 063132 |       | LDA T18    |                            |
| 0265  | 12661 | 067133 |       | LDB T19    |                            |
| 0266  | 12662 | 173125 |       | STA T11, I |                            |
| 0267  | 12663 | 037125 |       | ISZ T11    |                            |
| 0268  | 12664 | 177125 |       | STB T11, I |                            |
| 0269  | 12665 | 037125 |       | ISZ T11    |                            |
| 0270  | 12666 | 037126 |       | ISZ T12    | SKIP IF DONE               |

|       |       |        |       |              |                             |
|-------|-------|--------|-------|--------------|-----------------------------|
| 0271  | 12667 | 026626 |       | JMP LINV3    | SWAP NEXT ELEMENT           |
| 0272* |       |        |       |              | HAVE LARGEST ELEMENT IN     |
| 0273* |       |        |       |              | PIVOTAL POSITION. FIND      |
| 0274* |       |        |       |              | VALUE AND TEST TO ZERO      |
| 0275* |       |        |       |              | FOR SINGULAR MATRIX         |
| 0276  | 12670 | 063134 |       | LDA LPIV     | COMPUTE                     |
| 0277  | 12671 | 067134 |       | LDB LPIV     | ADDRESS OF                  |
| 0278  | 12672 | 017067 |       | JSB LWHR     | PIVOT                       |
| 0279  | 12673 | 073113 |       | STA T1       | ELEMENT                     |
| 0280  | 12674 | 016230 |       | JSB .DLD     | PIVOT VALUE                 |
| 0281  | 12675 | 113113 |       | DEF T1,I     |                             |
| 0282  | 12676 | 002020 |       | SSA          | OBTAIN ABSOLUTE VALUE       |
| 0283  | 12677 | 015423 |       | JSB ARINV    | IF NUMBER IS NEGATIVE       |
| 0284  | 12700 | 114237 |       | JSB .FSBA,I  | SUBTRACT TOLERANCE AND      |
| 0285  | 12701 | 000171 |       | DEF MLBX1    |                             |
| 0286  | 12702 | 002020 |       | SSA          | COMPARE TO ZERO             |
| 0287  | 12703 | 014477 |       | JSB ERROR    | PRINT 'NEARLY SING MATRIX'  |
| 0288* |       |        |       |              | DIVIDE PIVOT ROW AND ROW    |
| 0289* |       |        |       |              | IN I-MAT BY PIVOT VALUE     |
| 0290  | 12704 | 063113 | LDLM1 | LDA T1       | ADDRESS OF PIOT ELEMENT     |
| 0291  | 12705 | 073114 |       | STA T2       |                             |
| 0292  | 12706 | 060466 |       | LDA HONE     | LOAD                        |
| 0293  | 12707 | 064325 |       | LDB .2       | 1.0                         |
| 0294  | 12710 | 114241 |       | JSB .FDVA,I  |                             |
| 0295  | 12711 | 113113 |       | DEF T1,I     |                             |
| 0296  | 12712 | 073132 |       | STA T18      | INVERSE OF PIVOT            |
| 0297  | 12713 | 077133 |       | STB T19      |                             |
| 0298* |       |        |       |              | MULT ROW BY 1/PIVOT         |
| 0299* |       |        |       |              | STARTING AT PIVOT+1         |
| 0300  | 12714 | 063134 |       | LDA LPIV     |                             |
| 0301  | 12715 | 073125 |       | STA T11      | COUNTER FOR ROW             |
| 0302  | 12716 | 037125 | LINV6 | ISZ T11      | INCREMENT COUNTER           |
| 0303  | 12717 | 063125 |       | LDA T11      |                             |
| 0304  | 12720 | 053116 |       | CPA T4       | TEST FOR END OF ROW         |
| 0305  | 12721 | 026733 |       | JMP LIN12    |                             |
| 0306  | 12722 | 037114 |       | ISZ T2       | ADDRESS OF NEXT ELEMENT     |
| 0307  | 12723 | 037114 |       | ISZ T2       |                             |
| 0308  | 12724 | 016230 |       | JSB .DLD     |                             |
| 0309  | 12725 | 113114 |       | DEF T2,I     |                             |
| 0310  | 12726 | 114240 |       | JSB .FMPIA,I |                             |
| 0311  | 12727 | 013132 |       | DEF T18      |                             |
| 0312  | 12730 | 016240 |       | JSB .DST     |                             |
| 0313  | 12731 | 113114 |       | DEF T2,I     |                             |
| 0314  | 12732 | 026716 |       | JMP LINV6    |                             |
| 0315* |       |        |       |              | MULT ROW IN I-MATRIX BY     |
| 0316* |       |        |       |              | 1/PIVOT. SKIP IF ELEMENT=0  |
| 0317  | 12733 | 063124 | LIN12 | LDA T10      | ADDRESS OF PIVOT ROW        |
| 0318  | 12734 | 073117 |       | STA T5       | IN I-MATRIX                 |
| 0319  | 12735 | 063115 |       | LDA T3       |                             |
| 0320  | 12736 | 003004 |       | CMA,INA      | SET                         |
| 0321  | 12737 | 073125 |       | STA T11      | ROW COUNTER                 |
| 0322  | 12740 | 016230 | LIN13 | JSB .DLD     |                             |
| 0323  | 12741 | 113117 |       | DEF T5,I     |                             |
| 0324  | 12742 | 002003 |       | SZA,RSS      | SKIP MULTIPLICATION IF ZERO |
| 0325  | 12743 | 006002 |       | SZB          |                             |
| 0326  | 12744 | 026746 |       | JMP **2      | NOT ZERO                    |

|       |       |        |               |                                  |
|-------|-------|--------|---------------|----------------------------------|
| 0327  | 12745 | 026752 | JMP LIN14     | ZERO                             |
| 0328  | 12746 | 114240 | JSB .FMPA,I   |                                  |
| 0329  | 12747 | 013132 | DEF T18       |                                  |
| 0330  | 12750 | 016240 | JSB .DST      |                                  |
| 0331  | 12751 | 113117 | DEF T5,I      |                                  |
| 0332  | 12752 | 037117 | LIN14 ISZ T5  | NEXT ELEMENT IN I-MATRIX         |
| 0333  | 12753 | 037117 | ISZ T5        |                                  |
| 0334  | 12754 | 037125 | ISZ T11       | DONE?                            |
| 0335  | 12755 | 026740 | JMP LIN13     | NO                               |
| 0336* |       |        |               | PERFORM ROW MANIPULATIONS        |
| 0337* |       |        |               | AND SUBTRACTIONS TO REDUCE       |
| 0338* |       |        |               | PIVOT COLUMN TO ZERO             |
| 0339  | 12756 | 002400 | CLA           |                                  |
| 0340  | 12757 | 070173 | STA B1        |                                  |
| 0341  | 12760 | 034173 | LINV4 ISZ B1  | SELECT NEXT ROW                  |
| 0342  | 12761 | 060173 | LDA B1        |                                  |
| 0343  | 12762 | 053116 | CPA T4        | TEST FOR LAST ROW                |
| 0344  | 12763 | 026535 | JMP LINV1     | SELECT NEXT PIVOT                |
| 0345  | 12764 | 053134 | CPA LPIV      | TEST TO SKIP PIVOTAL ROW         |
| 0346  | 12765 | 026760 | JMP LINV4     | SKIP PIVOTAL ROW                 |
| 0347  | 12766 | 060173 | LDA B1        |                                  |
| 0348  | 12767 | 006404 | CLB,INB       |                                  |
| 0349  | 12770 | 017101 | JSB LWHR2     | ADDRESS OF ROW TO BE TRANSFORMED |
| 0350  | 12771 | 073125 | STA T11       | IN I-MATRIX                      |
| 0351* |       |        |               | COMPUTE MULTIPLIER WHICH         |
| 0352* |       |        |               | IS THAT ELEMENT IN ROW TO        |
| 0353* |       |        |               | BE TRANSFORMED WHICH LIES        |
| 0354* |       |        |               | IN THE PIVOTAL COLUMN            |
| 0355  | 12772 | 060173 | LDA B1        |                                  |
| 0356  | 12773 | 067134 | LDB LPIV      |                                  |
| 0357  | 12774 | 017067 | JSB LWHR      |                                  |
| 0358  | 12775 | 073123 | STA T9        | SAVE ADDRESS                     |
| 0359  | 12776 | 016230 | JSB .DLD      |                                  |
| 0360  | 12777 | 100000 | DEF 0,I       |                                  |
| 0361  | 13000 | 073121 | STA T7        | VALUE OF MULTIPLIER              |
| 0362  | 13001 | 077122 | STB T8        |                                  |
| 0363* |       |        |               | DO ELIMINATION OF ROWS IN        |
| 0364* |       |        |               | ORIGINAL MATRIX, START AT        |
| 0365* |       |        |               | COLUMN LPIV+1                    |
| 0366  | 13002 | 063134 | LDA LPIV      |                                  |
| 0367  | 13003 | 073127 | STA T13       | COUNTER                          |
| 0368  | 13004 | 063113 | LDA T1        |                                  |
| 0369  | 13005 | 073114 | STA T2        |                                  |
| 0370  | 13006 | 037127 | LINV5 ISZ T13 |                                  |
| 0371  | 13007 | 063127 | LDA T13       |                                  |
| 0372  | 13010 | 053116 | CPA T4        | TEST FOR LAST TERM IN ROW        |
| 0373  | 13011 | 027033 | JMP LIN15     |                                  |
| 0374  | 13012 | 037123 | ISZ T9        | T9 IS ADDRESS OF                 |
| 0375  | 13013 | 037123 | ISZ T9        | ELEMENT TO BE CHANGED            |
| 0376  | 13014 | 037114 | ISZ T2        | T2 IS ADDR OF CORRESPONDING      |
| 0377  | 13015 | 037114 | ISZ T2        | ELEMENT IN PIVOTAL ROW           |
| 0378  | 13016 | 063121 | LDA T7        |                                  |
| 0379  | 13017 | 067122 | LDB T8        |                                  |
| 0380  | 13020 | 114240 | JSB .FMPA,I   |                                  |
| 0381  | 13021 | 113114 | DEF T2,I      |                                  |
| 0382  | 13022 | 073132 | STA T18       | MULTIPLIER*VALUE IN              |

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0383 13023 077133      STB T19          PIVOT ROW
0384 13024 016230      JSB .DLD
0385 13025 113123      DEF T9,I
0386 13026 114237      JSB .FSBA,I
0387 13027 013132      DEF T18
0388 13030 016240      JSB .DST          TRANSFORMED ELEMENT
0389 13031 113123      DEF T9,I
0390 13032 027006      JMP LINV5        SELECT NEXT TERM
0391*
0392*
0393*
0394*
0395*
0396 13033 063124      LIN15 LDA T10      DO ELIMINATION OF ROWS IN
0397 13034 073117      STA T5          IDENTITY MATRIX. START AT
0398 13035 063115      LDA T3          ADDRESS OF
0399 13036 003004      CMA,INA        PIVOTAL ROW
0400 13037 073127      STA T13        SET
0401 13040 163117      LIN18 LDA T5,I    COUNTER
0402 13041 037117      ISZ T5
0403 13042 167117      LDB T5,I
0404 13043 037117      ISZ T5
0405 13044 002003      SZA,RSS        SKIP IF ZERO
0406 13045 006002      SZB
0407 13046 027050      JMP ++2        NOT ZERO
0408 13047 027062      JMP LIN17      ZERO
0409 13050 114240      JSB .FMPA,I    MULTIPLY BY
0410 13051 013121      DEF T7        MULTIPLIER
0411 13052 073132      STA T18
0412 13053 077133      STB T19
0413 13054 016230      JSB .DLD
0414 13055 113125      DEF T11,I
0415 13056 114237      JSB .FSBA,I
0416 13057 013132      DEF T18
0417 13060 016240      JSB .DST
0418 13061 113125      DEF T11,I
0419 13062 037125      LIN17 ISZ T11
0420 13063 037125      ISZ T11
0421 13064 037127      ISZ T13
0422 13065 027040      JMP LIN18      SELECT NEXT TERM
0423 13066 026760      JMP LINV4      ELIMINATE NEXT ROW
0424*
0425*
0426*****
0427*****      SUBROUTINE LWHR          *****
0428*****
0429*SUBROUTINE COMPUTES ADDRESS OF AN ELEMENT *
0430*IN MATRIX GIVEN BY B2. ROW AND COL VALUES *
0431*ARE SUPPLIED IN A,B. ADDRESS IS LEFT IN A *
0432*ENTRY LWHR2 COMPUTES ADDR IN MAT B3 *
0433*****
0434*
0435 13067 000000      LWHR NOP
0436 13070 077121      STB T7          SAVE COLUMN #
0437 13071 040431      ADA M1
0438 13072 015236      JSB MPY

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0439 13073 013115      DEF T3      (A-1)*T3
0440 13074 043121      ADA T7
0441 13075 040431      ADA M1      +(B-1)
0442 13076 001000      ALS
0443 13077 040175      ADA B2      DDR=B2+2((A-1)*T3+(B-1))
0444 13100 127067      JMP LWHR,I
0445 13101 000000      LWHR2 NOP
0446 13102 077121      STB T7
0447 13103 040431      ADA M1
0448 13104 015236      JSB MPY
0449 13105 013115      DEF T3
0450 13106 043121      ADA T7
0451 13107 040431      ADA M1
0452 13110 001000      ALS
0453 13111 040177      ADA B3
0454 13112 127101      JMP LWHR2,I

```

0455\*

0456\*

0457\*\*\*\*\*

0458\* CONSTANTS \*

0459\*\*\*\*\*

0460\*

```

0461 13113 000000      T1      BSS 1      TEMPORARY CONSTANTS
0462 13114 000000      T2      BSS 1
0463 13115 000000      T3      BSS 1
0464 13116 000000      T4      BSS 1
0465 13117 000000      T5      BSS 1
0466 13120 000000      T6      BSS 1
0467 13121 000000      T7      BSS 1
0468 13122 000000      T8      BSS 1
0469 13123 000000      T9      BSS 1
0470 13124 000000      T10     BSS 1
0471 13125 000000      T11     BSS 1
0472 13126 000000      T12     BSS 1
0473 13127 000000      T13     BSS 1
0474 13130 041433      T16     DEC +1E-6      ABSOLUTE TOLERANCE
0475 13132 000000      T18     BSS 1
0476 13133 000000      T19     BSS 1
0477 13134 000000      LPIV    BSS 1
0478 13135 114236      LPLUS   JSB .FADA,I      GENERATES CODE
0479 13136 100175      DEF B2,I
0480 13137 114237      LMIN     JSB .FSBA,I      GENERATES CODE
0481 13140 114240      LTIME    JSB .FMPA,I      GENERATES CODE
0482 13141 034175      INCB2    ISZ B2      GENERATES CODE
0483 13142              FINIS   EQU *
0484                      END

```

\*\* NO ERRORS\*

PREPARE BASIC SYSTEM  
(REV. A)

|                |   |
|----------------|---|
| BINARY TAPE    | 20392-60002                               |
| SOURCE TAPES   | 20392-80012<br>20392-80013<br>20392-80014 |
| SOURCE LISTING | 20392-90002                               |

PAGE 0001

0001

\*\* NO ERRORS\*

ASPB,A,B,L

PREPARE BASIC SYSTEM--JANUARY 1, 1970

```

0001          ASMB,A,B,L      PREPARE BASIC SYSTEM--JANUARY 1, 1970
0003 00002          ORG 2
0004*
0005* THIS PRUGKAM WILL CONFIGURE AND PUNCH AS AN ABSOLUTE TAPE THE
0006* HP BASIC SYSTEM COMPATIBLE WITH 'BOSS'; INCLUSION OF THE 'BOSS'
0007* VERSION OF THE BASIC INTERPRETER IS OPTIONAL. TELETYPE,
0008* PHOTOREADER, AND PUNCH DRIVERS ARE SUPPLIED BY THIS PROGRAM.
0009* CUSTOM 'CALL' ROUTINES MAY BE INCLUDED IF THE BASIC INTERPRETER
0010* IS PRESENT. OPTIONS INCLUDE CHOICE OF BUFFERED OR SERIAL
0011* TELETYPE AND CONFIGURATION FOR 8, 16, 24, OR 32K OF
0012* MEMORY.
0013*
0014* THE AREAS PUNCHED ARE 4 THROUGH 'CONTENTS OF FWAM' -1 AND
0015* 'CONTENTS OF LWAM' +1 THROUGH 'CONTENTS OF LWM'; I.E., SYSTEM
0016* CODE AND DRIVER CODE.
0017*
0018* TO OPERATE -
0019*
0020* 1) LOAD THE PBS TAPE WITH THE PROTECTED LOADER.
0021* 2) (OPTIONAL) LOAD BASIC INTERPRETER ('CALL ROUTINES
0022* MAY ALSO BE LOADED IF DESIRED).
0023* 3) 'LOAD ADDRESS' 2 AND 'PRESET'.
0024* 4) SET SELECT CODE OF TELETYPE (IN OCTAL) INTO THE
0025* SWITCH REGISTER. SET SWITCH 15 TO 1 IF USING A
0026* SERIAL TELETYPE BOARD.
0027* 5) SET TELETYPE TO 'LINE,' TURN ON HIGH-SPEED TAPE PUNCH
0028* IF PRESENT, AND PRESS 'RUN'.
0029* 6) ANSWER TELETYPE REQUESTS APPROPRIATELY.
0030* 7) AFTER THE FLT 778, PRESS 'RUN' FOR EXTRA COPIES.
0031*
0032          SUP          SUPPRESS LISTING OF MULTIPLE OPERANDS
0033*
0034 00002 124003      JMP 3,I          BEGIN
0035 00003 016333      DEF START        EXECUTION
0036*
0037 00004 103004      HLT 4,C          IN CASE OF POWER FAIL
0038 00005 102005      HLT 5          IN CASE OF PARITY FAULT
0039 00006 000000      OCT 0,0,0,0,0,0,0,0,0  NOP ALL MAIN-FRAME
0040 00017 000000      OCT 0,0,0,0,0,0,0,0,0  INTERRUPT LOCATIONS

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0042 16333          CRG 16333B
0043*
0044 16333 107700  START CLC 0,C      TURN OFF INTERRUPT, ALL DEVICES
0045 16334 102501      LIA 1          LOAD FROM SWITCH REGISTER
0046 16335 001623      ELA,RAR        PUT A(15) INTO (E)
0047 16336 013223      AND B77        MASK TO 6 BITS
0048 16337 073244      STA IOADR       SAVE I/O ADDRESS
0049 16340 001121      ARS,ARS        SHIFT OUT FIRST OCTAL DIGIT
0050 16341 001100      ARS
0051 16342 002002      SZA            IS I/O ADDRESS GT 7
0052 16343 026346      JMP GOMAN      YES THEN OK
0053*
0054 16344 102055      HLT 55B        INVALID TTY ADDRESS HALT
0055 16345 026334      JMP START+1    TRY AGAIN
0056*
0057*  SET TELETYPE I/C INSTRUCTION ADDRESSES
0058*
0059 16346 002040  GOMAN SEZ          BUFFERED TELETYPE?
0060 16347 127240      JMP SERLA,I    NO
0061 16350 063210      LDA M24        YES, LOAD # OF INSTRUCTIONS
0062 16351 067301      LDB LST1A     ADDRESS OF INSTRUCTION LIST
0063 16352 016646      JSB SETI      SET TTY I/O ADDRESSES
0064*
0065*  CALL FOR PHOTOREADER ADDRESS INPUT
0066*
0067 16353 016642  PHRDR JSB CRLFD    DO A CR/LF
0068 16354 063206      LDA M27        MESSAGE LENGTH, NEGATIVE NO CRLF
0069 16355 067056      LDB MA1        MESSAGE ADDRESS
0070 16356 016571      JSB GETAD      GET ADDRESS
0071 16357 026371      JMP NORDR     ADDRESS =0, NO READER
0072 16360 063214      LDA M5        VALID READER ADDRESS
0073 16361 067310      LDB LST2A     READER INSTRUCTION ADDRESS LIST
0074 16362 016646      JSB SETI      SET READER I/O INSTRUCTIONS
0075 16363 063307      LDA R0        SET CLC RDR
0076 16364 073524  PHRD1 STA R,OFF    INSTRUCTION
0077 16365 063247      LDA LWAMR
0078 16366 070111      STA LWAM      SET LAST WORD AVAILABLE MEMORY
0079 16367 002004      INA
0080 16370 070101      STA 101B      SET READER LINK
0081*
0082*  CALL FOR PUNCH ADDRESS INPUT
0083*
0084 16371 016642  NORDR JSB CRLFD
0085 16372 063211      LDA M20
0086 16373 067075      LDB MA2
0087 16374 016571      JSB GETAD
0088 16375 026407      JMP SYSDP
0089 16376 063214      LDA M5
0090 16377 067317      LDB LST3A
0091 16400 016646      JSB SETI
0092 16401 063316      LDA P0
0093 16402 073525  NORD1 STA P,OFF    INSTRUCTION
0094 16403 063250      LDA LWAMP
0095 16404 070111      STA LWAM      SET LWAM
0096 16405 002004      INA
0097 16406 070103      STA 103B      SET PUNCH LINK

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|       |                              |        |       |           |                                 |
|-------|------------------------------|--------|-------|-----------|---------------------------------|
| 0098* |                              |        |       |           |                                 |
| 0099* | CALL FOR DUMP DEVICE ADDRESS |        |       |           |                                 |
| 0100* |                              |        |       |           |                                 |
| 0101  | 16407                        | 016642 | SYSDP | JSB CRLFD | CR/LF                           |
| 0102  | 16410                        | 063207 |       | LDA M25   |                                 |
| 0103  | 16411                        | 067143 |       | LDB MA5   |                                 |
| 0104  | 16412                        | 016571 |       | JSB GETAD | GET DUMP I/O ADDRESS            |
| 0105  | 16413                        | 026421 |       | JMP CORAD | NO SYSTEM DUMP DEVICE AVAILABLE |
| 0106  | 16414                        | 063215 |       | LDA CM.4  | SYSTEM DUMP DEVICE AVAILABLE    |
| 0107  | 16415                        | 067324 |       | LDB LST4A | SET DEVICE'S I/O INSTRUCTIONS   |
| 0108  | 16416                        | 016646 |       | JSB SETI  |                                 |
| 0109  | 16417                        | 063246 |       | LDA PNCHI | SET PUNCH OUTPUT TO REFERENCE   |
| 0110  | 16420                        | 073245 |       | STA PNCHO | HIGH SPEED PUNCH ROUTINE        |
| 0111* |                              |        |       |           |                                 |
| 0112* | CALL FOR CORE SIZE           |        |       |           |                                 |
| 0113* |                              |        |       |           |                                 |
| 0114  | 16421                        | 016642 | CORAD | JSB CRLFD |                                 |
| 0115  | 16422                        | 063213 |       | LDA M12   | REQUEST                         |
| 0116  | 16423                        | 067161 |       | LDB MA6   |                                 |
| 0117  | 16424                        | 017445 | CORA1 | JSB TTY.P | CORE                            |
| 0118  | 16425                        | 063221 |       | LDA .20   |                                 |
| 0119  | 16426                        | 067010 |       | LDB BUF   | SIZE                            |
| 0120  | 16427                        | 000000 | CORA2 | NOP       |                                 |
| 0121  | 16430                        | 017426 |       | JSB TTY.1 |                                 |
| 0122  | 16431                        | 000000 |       | NOP       |                                 |
| 0123  | 16432                        | 002003 |       | SZA,RSS   | NULL ANSWER?                    |
| 0124  | 16433                        | 026532 |       | JMP DUMP  | YES, ASSUME 8K                  |
| 0125  | 16434                        | 163010 |       | LDA BUF,I | NO                              |
| 0126  | 16435                        | 053227 |       | CPA C8K   | '8 NULL'?                       |
| 0127  | 16436                        | 026532 |       | JMP DUMP  | YES                             |
| 0128  | 16437                        | 006400 |       | CLB       | NO                              |
| 0129  | 16440                        | 053230 |       | CPA C16K  | '16'?                           |
| 0130  | 16441                        | 026455 |       | JMP RELOC | YES                             |
| 0131  | 16442                        | 006004 |       | INB       | NO                              |
| 0132  | 16443                        | 053231 |       | CPA C24K  | '24'?                           |
| 0133  | 16444                        | 026455 |       | JMP RELOC | YES                             |
| 0134  | 16445                        | 006004 |       | INB       | NO                              |
| 0135  | 16446                        | 053232 |       | CPA C32K  | '32'?                           |
| 0136  | 16447                        | 026455 |       | JMP RELOC | YES                             |
| 0137  | 16450                        | 016642 |       | JSB CRLFD | NO                              |
| 0138  | 16451                        | 063212 |       | LDA M15   |                                 |
| 0139  | 16452                        | 067170 |       | LDB MA7   | PRINT                           |
| 0140  | 16453                        | 017445 | CORA3 | JSB TTY.P | ERROR                           |
| 0141  | 16454                        | 026421 |       | JMP CORAD | TRY AGAIN                       |

```

0143*
0144*  RELOCATE DRIVERS
0145*
0146  16455 047233 RELOC ADB INCIN LOAD
0147  16456 164001 LDB 1,I DISPLACEMENT
0148  16457 063237 LDA LWM ADJUST
0149  16460 040001 ADA 1
0150  16461 073237 STA LWM ABSOLUTE
0151  16462 063672 LDA CRLFA
0152  16463 040001 ADA 1 POINTERS
0153  16464 073672 STA CRLFA
0154  16465 060101 LDA 101B
0155  16466 040001 ADA 1
0156  16467 002021 SSA,RSS
0157  16470 070101 STA 101B
0158  16471 060102 LDA 102B
0159  16472 040001 ADA 1
0160  16473 070102 STA 102B
0161  16474 060103 LDA 103B
0162  16475 040001 ADA 1
0163  16476 002021 SSA,RSS
0164  16477 070103 STA 103B
0165  16500 060104 LDA 104B
0166  16501 040001 ADA 1
0167  16502 070104 STA 104B
0168  16503 060111 LDA LWAM
0169  16504 073241 STA SOURC SAVE ADDRESS OF DRIVER MODULE
0170  16505 040001 ADA 1
0171  16506 070111 STA LWAM
0172  16507 073242 STA DEST SET DESTINATION ADDRESS
0173  16510 060123 LDA IMOFF
0174  16511 040001 ADA 1
0175  16512 070123 STA IMOFF
0176  16513 060124 LDA IMON
0177  16514 040001 ADA 1
0178  16515 070124 STA IMON
0179  16516 060125 LDA TLINK
0180  16517 040001 ADA 1
0181  16520 070125 STA TLINK
0182  16521 067237 LDB LWM COMPUTE
0183  16522 007004 CMB,INB # OF WORDS
0184  16523 044111 ADB LWAM TO BE MOVED
0185  16524 037241 MOREM ISZ SOURC ADVANCE
0186  16525 037242 ISZ DEST POINTERS
0187  16526 163241 LDA SOURC,I MOVE A
0188  16527 173242 STA DEST,I WORD
0189  16530 006006 INB,SZB DONE?
0190  16531 026524 JMP MOREM NO

```

0192\*

0193\*

THIS SECTION DUMPS THE ELEMENTS OF THE SYSTEM LOADED

0194\*

|       |       |        |       |           |                                  |
|-------|-------|--------|-------|-----------|----------------------------------|
| 0195  | 16532 | 016642 | DUMP  | JSB CRLFU |                                  |
| 0196  | 16533 | 060111 |       | LDA LWAM  | SET STARTING                     |
| 0197  | 16534 | 043204 |       | ADA M36   | ADDRESS FOR                      |
| 0198  | 16535 | 070131 |       | STA IOBFA | I/O BUFFER                       |
| 0199  | 16536 | 070117 |       | STA SYMTA | SET SYMBOL TABLE POINTER         |
| 0200  | 16537 | 043203 |       | ADA M97   | SET STARTING ADDRESS             |
| 0201  | 16540 | 070134 |       | STA SBUFA | FOR SYNTAX BUFFER                |
| 0202  | 16541 | 043216 |       | ADA M1    |                                  |
| 0203  | 16542 | 070111 |       | STA LWAM  | SAVE VALUE CORRECTED FOR BUFFERS |
| 0204  | 16543 | 070106 |       | STA LWBM  | FOR STAND-ALONE OPERATION        |
| 0205  | 16544 | 063245 |       | LDA PNCHO |                                  |
| 0206  | 16545 | 053246 |       | CPA PNCHI | SYSTEM DUMP DEVICE AVAILABLE?    |
| 0207  | 16546 | 026555 |       | JMP COPY  | PUNCH IS AVAILABLE               |
| 0208* |       |        |       |           |                                  |
| 0209  | 16547 | 063222 |       | LDA .30   |                                  |
| 0210  | 16550 | 067110 |       | LDB MA3   |                                  |
| 0211  | 16551 | 017445 | DUMP1 | JSB TTY.P | REQUEST TTY PUNCH ON             |
| 0212* |       |        |       |           |                                  |
| 0213  | 16552 | 060126 | DUMP2 | LDA PLSTR | PREPARE TO                       |
| 0214  | 16553 | 070127 |       | STA LISTR | PUNCH                            |
| 0215  | 16554 | 102011 |       | HLT 11B   |                                  |
| 0216* |       |        |       |           |                                  |
| 0217  | 16555 | 017004 | COPY  | JSB LTG   | GENERATE LEADER                  |
| 0218  | 16556 | 063220 |       | LDA .4    | DUMP                             |
| 0219  | 16557 | 007400 |       | CCB       | LOCATIONS 4                      |
| 0220  | 16560 | 044110 |       | ADB FWAM  | THROUGH                          |
| 0221  | 16561 | 016734 |       | JSB PNCHA | (FWAM)-1                         |
| 0222  | 16562 | 060111 |       | LDA LWAM  | DUMP                             |
| 0223  | 16563 | 043224 |       | ADA .135  | DRIVER                           |
| 0224  | 16564 | 067237 |       | LDB LWM   | AREA                             |
| 0225  | 16565 | 016734 |       | JSB PNCHA |                                  |
| 0226  | 16566 | 017004 |       | JSB LTG   | GENERATE TRAILER                 |
| 0227  | 16567 | 102077 |       | HLT 77B   | END OF DUMP ROUTINE              |
| 0228  | 16570 | 026555 |       | JMP COPY  | GO MAKE ANOTHER COPY             |



```

0230*
0231* SUBROUTINE GETAD
0232*
0233* THIS SUBROUTINE CALLS FOR I/O ADDRESS INPUT, PROCESSES THE
0234* INPUT AND IF INPUT VALID RETURNS TO P+2. IF NOTHING IS
0235* INPUTTED IT RETURNS TO P+1 WITH LINK TO STOP IN A
0236*
0237* CALL: JSB GETAD
0238* (A) = LENGTH OF MESSAGE ASKING FOR I/O ADDRESS
0239* (B) = ADDRESS OF MESSAGE
0240*
0241* RETURN: ZERO INPUT - P+1 (A) = LINK TO STOP
0242* VALID ADDRESS - P+2 (A) = I/O ADDRESS
0243*
0244* I/O ADDRESS IS SAVED IN LOCATION IOADR
0245*
0246* IF INPUT IS INVALID (IE NOT TWO NUMBERS 10-77)
0247* "INVALID I/O ADDRESS" IS TYPED AND IT WAITS
0248* FOR FURTHER INPUT.
0249*
0250 16571 000000 GETAD NOP
0251 16572 017445 JSB TTY.P PRINT INPUT REQUEST MESSAGE
0252 16573 063221 INPUT LDA .20
0253 16574 067010 LDB BUF
0254 16575 000000 GETA1 NOP WAIT
0255 16576 017426 JSB TTY.I FOR
0256 16577 000000 NOP INPUT
0257 16600 002003 SZA,RSS ANY ADDRESS?
0258 16601 126571 JMP GETAD,I NO ADDRESS
0259 16602 053656 CPA .2 TWO CHARACTERS INPUT?
0260 16603 020612 JMP TWOCH TWO CHARACTERS INPUTTED
0261*
0262 16604 016642 ERRO. JSB CRLFD INVALID INPUT ERROR
0263 16605 063221 LDA .20
0264 16606 067130 LDB MA4
0265 16607 017445 GETA2 JSB TTY.P PRINT 'INVALID INPUT'
0266 16610 016642 JSB CRLFD DO A RETURN AND LINE FEED
0267 16611 026573 JMP INPUT RETURN FOR MORE INPUT
0268*
0269 16612 163010 TWCCB LDA BUF,I GET FIRST TWO CHARACTERS
0270 16613 001727 ALF,ALF LOOK AT FIRST CHARACTER
0271 16614 016631 JSB NBER CHECK FOR VALID OCTAL,YES,CONVRT
0272 16615 026604 JMP ERRO. NOT OCTAL
0273 16616 002003 SZA,RSS ADDRESS > 7 ?
0274 16617 026604 JMP ERRO. NO
0275 16620 001723 ALF,RAR MOVE FIRST DIGIT 3 BITS LEFT
0276 16621 073244 STA IOADR AND SAVE
0277 16622 163010 LDA BUF,I
0278 16623 016631 JSB NBER CHECK SECOND CHARACTER
0279 16624 026604 JMP ERRO. NOT OCTAL
0280 16625 033244 IOR IOADR FORM TWO DIGIT OCTAL NUMBER
0281 16626 073244 STA IOADR SAVE I/O ADDRESS
0282 16627 036571 ISZ GETAD NON-ZERO I/O ADDRESS
0283 16630 126571 JMP GETAD,I RETURN

```

```

0285*
0286* SUBROUTINE NBER
0287*
0288* THIS SUBROUTINE CHECKS WHETHER THE CHARACTER IN A REPRESENTS
0289* A VALID OCTAL DIGIT. IF THE CHARACTER IS VALID IT IS
0290* CONVERTED TO AN OCTAL DIGIT.
0291*
0292* RETURN: P+1 INVALID OCTAL CHARACTER
0293* P+2 VALID OCTAL CHARACTER
0294* (A) = OCTAL DIGIT
0295*
0296*
0297 16631 000000 NBER NOP
0298 16632 013666 AND B177 MASK TO ONE CHARACTER
0299 16633 043205 ADA N60 SUBTRACT OCTAL 60
0300 16634 070001 STA 1 TRANSFER TO B
0301 16635 005121 BRS,BRS
0302 16636 005100 BRS SHIFT OUT FIRST 3 BITS
0303 16637 006003 SZB,RSS IS B ZERO
0304 16640 036631 ISZ NBER B=0, VALID DIGIT, RETURN TO P+2
0305 16641 126631 JMP NBER,I RETURN

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0307*
0308* SUBROUTINE CRLFD OUTPUTS A CARRIAGE RETURN AND LINE FEED.
0309*
0310 16642 000000 CRLFD NOP EXIT/ENTRY
0311 16643 002400 CLA
0312 16644 017445 CRLF1 JSB TTY.P DO CR/LF
0313 16645 126642 JMP CRLFD,I EXIT

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0315*
0316* SUBROUTINE SETI
0317*
0318* THIS SUBROUTINE MODIFIES THE ADDRESSES SPECIFIED IN A LIST
0319*
0320* CALL: JSB SETI
0321* (A) = NUMBER OF LOCATIONS TO BE MODIFIED (2'S COMP)
0322* (B) = STARTING ADDRESS OF LIST OF ADDRESSES
0323*
0324*
0325 16646 000000 SETI NOP EXIT/ENTRY
0326 16647 073676 STA COUNT SAVE LENGTH OF LIST
0327 16650 077675 STB BADDR SET LIST STARTING ADDRESS
0328 16651 167675 LOCP LDB BADDR,I LOAD ADDRESS OF INSTRUCTION
0329 16652 160001 LDA 1,I LOAD INSTRUCTION TO BE MODIFIED
0330 16653 013201 AND MASK ZERO I/O PART, MASK=177700
0331 16654 033244 IOR IOADR INSERT I/O ADDRESS
0332 16655 170001 STA 1,I SET MODIFIED INSTRUCTION
0333 16656 037675 ISZ BADDR INDEX LIST POINTER
0334 16657 037676 ISZ COUNT
0335 16660 026651 JMP LOOP GO DO NEXT LOCATION
0336 16661 126646 JMP SETI,I RETURN

```

```

0338*
0339* SUBROUTINE (TOUT) TO OUTPUT ONE CHARACTER
0340* TO TELETYPE. CHARACTER IS IN (A). (B) IS NOT ALTERED.
0341*
0342 16662 000000 TOLT NOP
0343 16663 102600 TP,11 OTA TTY LOAD BOARD BUFFER
0344 16664 103700 STC TTY,C GIVE PUNCH COMMAND
0345 16665 102300 SFS TTY WAIT FOR
0346 16666 026665 JMP *-1 COMPLETION
0347 16667 126662 JMP TOUT,I

```

```

0349*
0350* SUBROUTINE (POUT) TO OUTPUT ONE CHARACTER TO
0351* PUNCH DEVICE. CHARACTER IS IN (A). (B) IS NOT ALTERED.
0352*
0353 16670 000000 POUT NOP
0354 16671 102600 OTA PNCH FILL BOARD BUFFER
0355 16672 103700 STC PNCH,C REQUEST PUNCH
0356 16673 102300 SFS PNCH WAIT UNTIL
0357 16674 026673 JMP *-1 DONE
0358 16675 126670 JMP POUT,I

```

```

0360*
0361*  SUBROUTINE PUNCH
0362*
0363*  THIS SUBROUTINE PROVIDES THE MEANS OF PUNCHING BINARY
0364*  RECORDS ON THE TELETYPE OR HIGH SPEED PUNCH.
0365*
0366*  CALLING SEQUENCE  JSB PUNCH
0367*
0368*      (A) = LENGTH (AND MODE) OF RECORD TO BE OUTPUT
0369*      (B) = STARTING ADDRESS OF DATA BUFFER
0370*
0371*  BINARY OUTPUT IS INDICATED BY A NEGATIVE (2S COMPLE-
0372*  MENT) VALUE IN A.  THIS NEGATIVE VALUE IS THE
0373*  NUMBER OF WORDS TO BE OUTPUT.
0374*
0375*  IF A = 0 ON ENTRY 10 INCHES OF FEED FRAMES ARE PUNCHED
0376*
0377  16676 000000 PUNCH NOP          EXIT/ENTRY
0378  16677 077050          STB BUFF    SAVE STARTING ADDRESS OF BUFFER
0379  16700 067515          LDB PMODE
0380  16701 106600 TP.9  OTB TTY      SET TTY TO PUNCH MODE
0381  16702 002002          SZA        CHECK FOR FEED FRAMES ONLY
0382  16703 026706          JMP *+3    NOT FEED FRAME MODE
0383  16704 063202          LDA .200
0384  16705 026724          JMP PP03+1 DO FEED FRAMES ONLY
0385*
0386  16706 001000          ALS        CONVERT COUNT TO CHARACTERS (X2)
0387  16707 073243          STA CHC1   AS COUNTER FOR OUTPUT SECTION.
0388  16710 067226          LDB UL52   SET UPPER/LOWER INDICATOR
0389*
0390*  CHARACTER OUTPUT SECTION
0391*
0392  16711 163050 PP02 LDA BUFF,I    GET WORD CONTAINING CHARACTER
0393  16712 006021          SSB,RSS    IF UPPER/LOWER FLAG SAYS UPPER
0394  16713 001727          ALF,ALF    (SIGN = 0) ROTATE TO LOWER
0395  16714 013225          AND M377   REMOVE UPPER CHARACTER
0396  16715 117245          JSB PNCHO,I OUTPUT CHARACTER
0397  16716 006020          SSB        IF CHAR. OUTPUT WAS LOWER CHAR.,
0398  16717 037050          ISZ BUFF    ADD 1 TO BUFFER ADDRESS.
0399  16720 005200          RBL        SET UPPER/LOWER FLAG FOR NEXT CHA
0400  16721 037243          ISZ CHC1   INDEX CHARACTER COUNTER.
0401  16722 026711          JMP PP02   NOT ZERO, MORE TO OUTPUT.
0402*
0403*  COMPLETION SECTION
0404*
0405  16723 063215 PP03 LDA CM.4      BINARY SECTION. SET BUFF = -4
0406  16724 073050          STA BUFF    FOR COUNTER FOR FEED-FRAMES
0407  16725 002400          CLA        SET A = ZERO( FEED-FRAME).
0408  16726 117245          JSB PNCHO,I OUTPUT FEED FRAME
0409  16727 037050          ISZ BUFF    INDEX COUNTER
0410  16730 026725          JMP *-3     CONTINUE OUTPUT
0411  16731 106700 TP.10 CLC TTY     TURN OFF TTY
0412  16732 106700 PN8  CLC PNCH     TURN OFF PUNCH
0413  16733 126676          JMP PUNCH,I EXIT

```

0415\*

0416\* SUBROUTINE- PNCHA (PUNCH ABSOLUTE BLOCK)

0417\*

0418\* UPON ENTRY --

0419\* (A) = ADDRESS OF FIRST WORD OF BLOCK

0420\* (B) = ADDRESS OF LAST WORD OF BLOCK

0421\*

|       |       |        |       |             |                                 |
|-------|-------|--------|-------|-------------|---------------------------------|
| 0422  | 16734 | 000000 | PNCHA | NOP         |                                 |
| 0423  | 16735 | 006004 |       | INB         | SET = TO LAST +1M FOR EOB CHECK |
| 0424  | 16736 | 073051 |       | STA T1      | SAVE FIRST AND LAST WORD        |
| 0425  | 16737 | 077052 |       | STB T2      | ADDRESSES OF BLOCK.             |
| 0426  | 16740 | 063206 | P1    | LDA M27     | SET T3 = -27 AS INDEX FOR       |
| 0427  | 16741 | 073053 |       | STA T3      | FILLING BUFFER.                 |
| 0428  | 16742 | 063051 |       | LDA T1      | SET BUF+1 FOR LOAD ADDRESS      |
| 0429  | 16743 | 173011 |       | STA BUF,1   | OF CURRENT BLOCK.               |
| 0430  | 16744 | 073055 |       | STA CKSUM   | INITIALIZE CHECKSUM WORD.       |
| 0431  | 16745 | 002400 |       | CLA         | INITIALIZE                      |
| 0432  | 16746 | 173010 |       | STA BUF,1   | WORD COUNT                      |
| 0433  | 16747 | 063010 |       | LDA BUF     | SET T4 = ADDRESS                |
| 0434  | 16750 | 043656 |       | ADA .2      | OF WORD 3 OF BUFFER             |
| 0435  | 16751 | 073054 |       | STA T4      | FOR STORING WORDS.              |
| 0436* |       |        |       |             |                                 |
| 0437  | 16752 | 163051 | P2    | LDA T1,1    | STORE CURRENT WORD FORM MEMORY  |
| 0438  | 16753 | 173054 |       | STA T4,1    | BLOCK IN BUFFER.                |
| 0439  | 16754 | 037051 |       | ISZ T1      | BUMP BLOCK ADDRESS              |
| 0440  | 16755 | 037054 |       | ISZ T4      | ADD 1 TO BUFFER ADDRESS         |
| 0441  | 16756 | 043055 |       | ADA CKSUM   | ADD WORD TO CUMULATED           |
| 0442  | 16757 | 073055 |       | STA CKSUM   | CHECKSUM                        |
| 0443  | 16760 | 137010 |       | ISZ BUF,1   | COUNT WORD STORED IN BUFFER.    |
| 0444  | 16761 | 063051 |       | LDA T1      | CHECK FOR END OF BLOCK.         |
| 0445  | 16762 | 053052 |       | CPA T2      |                                 |
| 0446  | 16763 | 026766 |       | JMP P3      | YES, FWA = LWA.                 |
| 0447  | 16764 | 037053 |       | ISZ T3      | INDEX BUFFER COUNTER.           |
| 0448  | 16765 | 026752 |       | JMP P2      | BUFFER NOT YET FILLED.          |
| 0449* |       |        |       |             |                                 |
| 0450  | 16766 | 063055 | P3    | LDA CKSUM   | BUFFER FILLED, SET CHECKSUM IN  |
| 0451  | 16767 | 173054 |       | STA T4,1    | LAST WORD IN BUFFER.            |
| 0452  | 16770 | 163010 |       | LDA BUF,1   | POSITION RECORD                 |
| 0453  | 16771 | 001727 |       | ALF,ALF     | WORD COUNT TO                   |
| 0454  | 16772 | 173010 |       | STA BUF,1   | UPPER CHARACTER IN WORD 1.      |
| 0455  | 16773 | 001727 |       | ALF,ALF     | REPOSITION, ADD 3 FOR           |
| 0456  | 16774 | 043217 |       | ADA C.03    | TOTAL RECORD LENGTH, SET        |
| 0457  | 16775 | 003004 |       | CMA,INA     | NEGATIVE FOR OUTPUT.            |
| 0458  | 16776 | 067010 |       | LDB BUF     | (B) = ADDR. OF BUFFER.          |
| 0459  | 16777 | 016676 |       | JSB PUNCH   | PUNCH RECORD                    |
| 0460* |       |        |       |             |                                 |
| 0461  | 17000 | 063051 |       | LDA T1      | CHECK AGAIN FOR COMPLETION OF   |
| 0462  | 17001 | 053052 |       | CPA T2      | PUNCHING BLOCK.                 |
| 0463  | 17002 | 126734 |       | JMP PNCHA,1 | YES, EXIT.                      |
| 0464  | 17003 | 026740 |       | JMP P1      | NO, SET NEXT RECORD.            |

```

0466*
0467* SUBROUTINE: LTG (LEADER/TRAILER GENERATOR)
0468*
0469*
0470* LTG PRODUCES APPROXIMATELY 10-INCHES
0471* OF BLANK TAPE (FEED-FRAMES)
0472*
0473 17004 000000 LTG NOP
0474 17005 002400 CLA SET FEED FRAME MODE A=0
0475 17006 016676 JSB PUNCH PUNCH FEED FRAMES
0476 17007 127004 JMP LTG,I EXIT.

```

```

0478*
0479* PUNCH BUFFER
0480*
0481 17010 017012 BUF DEF BUFFER
0482 17011 017013 BUF1 DEF BUFFER+1
0483*
0484 17012 000000 BUFFER BSS 30
0485 17050 000000 BUFF NOP
0486 17051 000000 T1 NOP
0487 17052 000000 T2 NOP
0488 17053 000000 T3 NOP
0489 17054 000000 T4 NOP
0490 17055 000000 CKSUM NOP

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0492*
0493* MESSAGE STORAGE SECTION
0494*
0495 17056 017057 MA1 DEF MSG1
0496 17057 020120 MSG1 ASC 14, PHOTO READER I/O ADDRESS?
0497 17075 017076 MA2 DEF MSG2
0498 17076 020120 MSG2 ASC 10, PUNCH I/O ADDRESS?
0499 17110 017111 MA3 DEF MSG3
0500 17111 020124 MSG3 ASC 15, TURN ON TTY PUNCH, PRESS RUN
0501 17130 017131 MA4 DEF MSG4
0502 17131 020111 MSG4 ASC 10, INVALID I/O ADDRESS
0503 17143 017144 MA5 DEF MSG5
0504 17144 020123 MSG5 ASC 13, SYSTEM DUMP I/O ADDRESS?
0505 17161 017162 MA6 DEF MSG6
0506 17162 020103 MSG6 ASC 6, CORE SIZE?
0507 17170 017171 MA7 DEF MSG7
0508 17171 020111 MSG7 ASC 8, IMPROPER INPUT

```

0510\*

0511\* CONSTANT AND DATA SECTION

0512\*

|      |       |        |      |     |        |
|------|-------|--------|------|-----|--------|
| 0513 | 17201 | 177700 | MASK | OCT | 177700 |
| 0514 | 17202 | 177470 | .200 | DEC | -200   |
| 0515 | 17203 | 177637 | M97  | DEC | -97    |
| 0516 | 17204 | 177734 | M36  | DEC | -36    |
| 0517 | 17205 | 177720 | M60  | OCT | -60    |
| 0518 | 17206 | 177745 | M27  | DEC | -27    |
| 0519 | 17207 | 177747 | M25  | DEC | -25    |
| 0520 | 17210 | 177750 | M24  | DEC | -24    |
| 0521 | 17211 | 177754 | M20  | DEC | -20    |
| 0522 | 17212 | 177761 | M15  | DEC | -15    |
| 0523 | 17213 | 177764 | M12  | DEC | -12    |
| 0524 | 17214 | 177773 | M5   | DEC | -5     |
| 0525 | 17215 | 177774 | CM.4 | DEC | -4     |
| 0526 | 17216 | 177777 | M1   | DEC | -1     |
| 0527 | 17217 | 000003 | C.03 | DEC | 3      |
| 0528 | 17220 | 000004 | .4   | DEC | 4      |
| 0529 | 17221 | 000024 | .20  | DEC | 20     |
| 0530 | 17222 | 000036 | .30  | DEC | 30     |
| 0531 | 17223 | 000077 | B77  | OCT | 77     |
| 0532 | 17224 | 000207 | .135 | DEC | 135    |
| 0533 | 17225 | 000377 | M377 | OCT | 377    |
| 0534 | 17226 | 052525 | UL52 | OCT | 52525  |

0535\*

|      |       |        |      |     |       |
|------|-------|--------|------|-----|-------|
| 0536 | 17227 | 034000 | C8K  | OCT | 34000 |
| 0537 | 17230 | 030466 | C16K | OCT | 30466 |
| 0538 | 17231 | 031064 | C24K | OCT | 31064 |
| 0539 | 17232 | 031462 | C32K | OCT | 31462 |

ACCEPTABLE  
CORE  
SIZE  
ANSWERS

0540\*

|      |       |        |       |     |       |
|------|-------|--------|-------|-----|-------|
| 0541 | 17233 | 017234 | INCIN | DEF | **1   |
| 0542 | 17234 | 020000 |       | OCT | 20000 |
| 0543 | 17235 | 040000 |       | OCT | 40000 |
| 0544 | 17236 | 060000 |       | OCT | 60000 |

RELOCATION  
  
INCREMENTS

0545\*

|      |       |        |       |     |       |
|------|-------|--------|-------|-----|-------|
| 0546 | 17237 | 017677 | LWM   | DEF | EOTC  |
| 0547 | 17240 | 015073 | SERLA | DEF | SRIAL |

LAST WORD AVAILABLE

0548\*

|      |       |        |       |     |  |
|------|-------|--------|-------|-----|--|
| 0549 | 17241 | 000000 | SOURC | NOP |  |
| 0550 | 17242 | 000000 | DEST  | NOP |  |
| 0551 | 17243 | 000000 | CHC1  | NOP |  |
| 0552 | 17244 | 000000 | LOADR | NOP |  |

0553\*

|      |       |        |       |     |      |
|------|-------|--------|-------|-----|------|
| 0554 | 17245 | 016662 | PNCHO | DEF | TOUT |
| 0555 | 17246 | 016670 | PNCHI | DEF | POUT |

PUNCH LINK LOCATION  
PUNCH REFERENCE INSTRUCTION

0556\*

|      |       |        |       |     |         |
|------|-------|--------|-------|-----|---------|
| 0557 | 17247 | 017367 | LWAMR | DEF | .HSPR-1 |
| 0558 | 17250 | 017346 | LWAMP | DEF | .PNCH-1 |

LWAM IF PHOTO READER  
LWAM IF PUNCH

0560\*

0561\* LIST OF INSTRUCTIONS (ADDRESSES) TO BE SET

0562\*

0563\*

0564\* TELETYPE INSTRUCTIONS ADDRESS LIST

0565\*

|      |       |        |       |     |         |
|------|-------|--------|-------|-----|---------|
| 0566 | 17251 | 017433 | LIST1 | DEF | TI.1    |
| 0567 | 17252 | 017434 |       | DEF | TI.2    |
| 0568 | 17253 | 017435 |       | DEF | TI.2+1  |
| 0569 | 17254 | 017437 |       | DEF | TI.3    |
| 0570 | 17255 | 017442 |       | DEF | TI.4    |
| 0571 | 17256 | 017522 |       | DEF | TI.5    |
| 0572 | 17257 | 017523 |       | DEF | TI.5+1  |
| 0573 | 17260 | 017531 |       | DEF | TI.6    |
| 0574 | 17261 | 017533 |       | DEF | TI.7    |
| 0575 | 17262 | 017534 |       | DEF | TI.7+1  |
| 0576 | 17263 | 017447 |       | DEF | TP.1    |
| 0577 | 17264 | 017456 |       | DEF | TP.2-1  |
| 0578 | 17265 | 017457 |       | DEF | TP.2    |
| 0579 | 17266 | 017462 |       | DEF | TP.4    |
| 0580 | 17267 | 017463 |       | DEF | TP.4+1  |
| 0581 | 17270 | 017464 |       | DEF | TP.5    |
| 0582 | 17271 | 017471 |       | DEF | TP.6    |
| 0583 | 17272 | 017500 |       | DEF | TP.7    |
| 0584 | 17273 | 017502 |       | DEF | TP.8    |
| 0585 | 17274 | 016701 |       | DEF | TP.9    |
| 0586 | 17275 | 016731 |       | DEF | TP.10   |
| 0587 | 17276 | 016663 |       | DEF | TP.11   |
| 0588 | 17277 | 016664 |       | DEF | TP.11+1 |
| 0589 | 17300 | 016665 |       | DEF | TP.11+2 |

0590\*

0591 17301 017251 LST1A DEF LIST1

0592\*

0593\* PHOTO READER INSTRUCTIONS ADDRESS LIST

0594\*

|      |       |        |       |     |     |
|------|-------|--------|-------|-----|-----|
| 0595 | 17302 | 017407 | LIST2 | DEF | PR3 |
| 0596 | 17303 | 017413 |       | DEF | PR5 |
| 0597 | 17304 | 017415 |       | DEF | PR6 |
| 0598 | 17305 | 017422 |       | DEF | PR7 |
| 0599 | 17306 | 017307 |       | DEF | RO  |

0600\*

0601 17307 106700 RO CLC RDR

0602 17310 017302 LST2A DEF LIST2

0603\*

0604\* HIGH SPEED PUNCH INSTRUCTIONS ADDRESS LIST

0605\*

|      |       |        |       |     |     |
|------|-------|--------|-------|-----|-----|
| 0606 | 17311 | 017353 | LIST3 | DEF | PN3 |
| 0607 | 17312 | 017354 |       | DEF | PN4 |
| 0608 | 17313 | 017355 |       | DEF | PN5 |
| 0609 | 17314 | 017362 |       | DEF | PN7 |
| 0610 | 17315 | 017316 |       | DEF | PO  |

0611\*

0612 17316 106700 PO CLC PNCH

0613 17317 017311 LST3A DEF LIST3



0615\*

0616\* SYSTEM DUMP INSTRUCTIONS ADDRESS LIST

0617\*

0618 17320 016732 LIST4 DEF PNB

0619 17321 016671 DEF POUT+1

0620 17322 016672 DEF POUT+2

0621 17323 016673 DEF POUT+3

0622\*

0623 17324 017320 LST4A DEF LIST4

0625\*

0626\* SKIP DIFFERENCE IN WORDS BETWEEN PARALLEL AND

0627\* SERIAL TELETYPE PACKAGES.

0628\*

0629 17325 000000 BSS 228 (STOP1-SPNCH)-(TT.II-.PNCH)

```

0002*
0003***** BASIC SYSTEM HIGH SPEED PUNCH DRIVER *****
0004*
0005*   OUTPUTS ASCII THROUGH THE HIGH SPEED PUNCH
0006*
0007*   CALL:   JSB 103B,I
0008*
0009*           (A) = NUMBER OF CHARACTERS TO BE PUNCHED
0010*           (B) = STARTING ADDRESS OF BUFFER
0011*
0012*
0013*   IF (A) IS >= 0 THEN OUTPUT (A) CHARACTERS
0014*   FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0015*
0016*   IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0017*
0018*   BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0019*
0020*   IF (B) = 0 ON ENTRY (A) FEED FRAMES ARE PUNCHED.
0021*   IF (A) = 0 ON ENTRY ONLY A CR/LF IS PUNCHED.
0022*
0023*
0024 17347 000000 .PNCH NOP
0025 17350 017636 PN1 JSB INIT          INITIALIZE FOR PUNCHING
0026 17351 017622 PN2 JSB GETCH        GET NEXT CHARACTER FROM BUFFER
0027 17352 027360      JMP PN6          BUFFER EMPTY
0028 17353 102600 PN3 OTA PNCH          LOAD PUNCH BUFFER
0029 17354 103700 PN4 STC PNCH,C        GIVE PUNCH COMMAND
0030 17355 102300 PN5 SFS PNCH
0031 17356 027355      JMP *-1          WAIT FOR PUNCH READY
0032 17357 027351      JMP PN2          GET NEXT CHARACTER
0033*
0034 17360 063671 PN6 LDA IORI
0035 17361 073633      STA FINSH+1      RESTORE IOR INSTRUCTION
0036 17362 106700 PN7 CLC PNCH          TURN OFF PUNCH
0037 17363 002141      SEZ,CLE,RSS     RECORD COMPLETE? CLEAR E
0038 17364 127347      JMP .PNCH,I     E=0, OUTPUT COMPLETE
0039 17365 063655      LDA M2          E=1, APPEND CR AND LF
0040 17366 067672      LDB CRLFA       LOAD ADDRESS OF CR AND LF
0041 17367 027350      JMP PN1         DO CR/LF

```

0043\*

0044\*\*\*\*\* BASIC SYSTEM PHOTO READER DRIVER \*\*\*\*\*

0045\*

0046\* INPUTS TAPE RECCRDS THROUGH THE PHOTO READER

0047\*

0048\* CALL: JSB 101B,1

0049\*

(A) = MAXIMUM NUMBER CHARS IN RECORD

0050\*

(B) = BUFFER STARTING ADDRESS

0051\*

0052\*

0053\*

ON RETURN (A) = -1 TOO MANY CHARACTERS IN RECORD

0054\*

(A) = -2 END OF TAPE DETECTED

0055\*

(A) = -3 NO TAPE OR GATE DOWN

0056\*

(A) = NUMBER OF CHARACTERS IN RECORD

0057\*

0058\*

INPUT IS PACKED TWO CHARACTERS PER WORD IN BUFFER.

0059\*

0060\*

ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.

0061\*

THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.

0062\*

0063\*

THE LEFT ARROW(S) - DELETE THE PREVIOUS CHARACTER(S).

0064\*

0065\*

AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL

0066\*

CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.

0067\*

0068\*

IF 10 NULL CHARACTERS ARE DETECTED BEFORE ANY CHARACTER,

0069\*

READING IS TERMINATED AND THE RETURN IS WITH A NULL RECORD.

0070\*

0071\*

0072

17370 000000 .HSPR NOP

0073

17371 073676 STA COUNT

SAVE LENGTH

0074

17372 077674 STB BUFSA

SAVE BUFFER STARTING ADDRESS

0075

17373 063653 PR1 LDA M11

0076

17374 073677 STA EOTC

INITIALIZE EOT COUNTER

0077

17375 067674 LDB BUFSA

0078

17376 077675 STB BADDR

INITIALIZE BUFFER POINTER

0079

17377 006400 CLB

INITIALIZE CHARACTER COUNT

0080

17400 006003 PR2 SZB,RSS

ANY NON-NULL CHARACTERS YET?

0081

17401 002002 SZA

NO, SKIP IF NULL

0082

17402 027407 JMP PR3

0083

17403 037677 ISZ EOTC

COUNT NULL

0084

17404 027407 JMP PR3

NOT YET 10 NULLS

0085

17405 063655 LDA M2

SET A TO INDICATE EOT (-2)

0086

17406 027422 JMP PR7

10 NULLS, TURN OFF READER & EXIT

0087

17407 103700 PR3 STC RDR,C

REQUEST CHARACTER

0088

17410 002400 CLA

SET DELAY COUNT

0089

17411 002007 PR4 INA,SZA,RSS

DELAY = 6.4 \* 65K = .41 SECONDS

0090

17412 027424 JMP PR8

(A)=0, NO TAPE OR GATE DOWN

0091

17413 102300 PR5 SFS RDR

0092

17414 027411 JMP PR4

NO FLAG, CHECK DELAY COUNT

0093

17415 103500 PR6 LIA RDR,C

LOAD CHARACTER

0094

17416 017537 JSB PROCS

PROCESS CHARACTER

0095

17417 027400 JMP PR2

GET NEXT CHARACTER

0096

17420 057655 CPB M2

RUBOUT IN THIS RECORD?

0097

17421 027373 JMP PR1

YES, IGNORE RECORD

0098

17422 106700 PR7 CLC RDR

TURN OFF READER

PAGE 0018 #02 BASIC SYSTEM HIGH SPEED PHOTO READER DRIVER

|       |       |        |     |             |                       |
|-------|-------|--------|-----|-------------|-----------------------|
| 0099  | 17423 | 127370 |     | JMP .HSPR,I |                       |
| 0100* |       |        |     |             |                       |
| 0101  | 17424 | 063654 | PR8 | LDA M3      | LOAD 'NO TAPE' STATUS |
| 0102  | 17425 | 027422 |     | JMP PR7     |                       |

0104\*

0105\*\*\*\*\* BASIC SYSTEM TELETYPE INPUT DRIVER \*\*\*\*\*

0106\*

0107\* INPUTS FROM AN ASR 33/35 THROUGH THE  
0108\* TELETYPE CONTROL BOARD FROM TAPE OR KEYBOARD.

0109\*

0110\* CALL: JSB 104B,1

0111\*

0112\* (A) = MAXIMUM NUMBER CHARS IN RECORD

0113\* (B) = BUFFER STARTING ADDRESS

0114\*

0115\* RETURN: (A) = -1 TOO MANY CHARACTERS IN RECORD

0116\* (A) = -2 RECORD DELETED

0117\* (A) = NUMBER OF CHARACTERS IN RECORD

0118\*

0119\*

0120\* THE CHARACTERS ARE PACKED TWO TO A WORD IN THE BUFFER.

0121\*

0122\* ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.

0123\* THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.

0124\*

0125\* THE LEFT ARROW(S) - DELETE THE PREVIOUS CHARACTER(S).

0126\*

0127\* AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL  
0128\* CHARACTERS IN THE RECORD, THE RECORD IS IGNORED.

0129\*

0130\*

|       |       |        |       |             |                          |
|-------|-------|--------|-------|-------------|--------------------------|
| 0131  | 17426 | 000000 | TTY.1 | NOP         |                          |
| 0132  | 17427 | 073676 |       | STA COUNT   | SAVE LENGTH              |
| 0133  | 17430 | 077675 |       | STB BADDR   | SET BUFFER ADDRESS       |
| 0134  | 17431 | 006400 |       | CLB         | SET CHARACTER COUNTER    |
| 0135  | 17432 | 063444 |       | LDA IMODE   |                          |
| 0136  | 17433 | 102600 | TI.1  | OTA TTY     | SET TTY TO INPUT MODE    |
| 0137  | 17434 | 103700 | TI.2  | STC TTY,C   | REQUEST CHARACTER        |
| 0138  | 17435 | 102300 |       | SFS TTY     |                          |
| 0139  | 17436 | 027435 |       | JMP *-1     | WAIT FOR CHARACTER INPUT |
| 0140  | 17437 | 102500 | TI.3  | LIA TTY     | LOAD CHARACTER           |
| 0141  | 17440 | 017537 |       | JSB PROCS   | PROCESS CHARACTER        |
| 0142  | 17441 | 027434 |       | JMP TI.2    | GET NEXT CHARACTER       |
| 0143  | 17442 | 106700 | TI.4  | CLC TTY     |                          |
| 0144  | 17443 | 127426 |       | JMP TTY.1,1 | RECORD COMPLETE RETURN   |
| 0145* |       |        |       |             |                          |
| 0146  | 17444 | 160000 | IMODE | OCT 160000  | LIST ONLY (INPUT-ASR 35) |

```

0148*
0149***** BASIC SYSTEM TELETYPE OUTPUT DRIVER *****
0150*
0151*   OUTPUTS ASCII RECORDS THROUGH THE TELETYPE PRINTER,
0152*   PUNCH, OR BOTH.
0153*
0154*   CALL:   JSB 102B,I
0155*
0156*           (A) = NUMBER OF CHARACTERS TO BE OUTPUT
0157*           (B) = STARTING ADDRESS OF BUFFER
0158*
0159*
0160*   IF (A) IS >= 0 THEN OUTPUT (A) CHARACTERS
0161*   FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0162*
0163*   IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0164*
0165*   BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0166*
0167*   IF (B) = 0 ON ENTRY OUTPUT (A) FEED FRAMES.
0168*   IF (A) = 0 ON ENTRY ONLY A CR/LF IS OUTPUT.
0169*
0170*
0171 17445 000000 TTY.P NOP
0172 17446 017636 JSB INIT      INITIALIZE AND SETUP
0173 17447 060000 TP.1 LDA TTY      SAVE TTY INTERRUPT
0174 17450 073517 STA TEMPI    INSTRUCTION
0175 17451 060127 LDA LISTR
0176 17452 050126 CPA PLSTR      PLIST?
0177 17453 063515 LDA PMODE     YES
0178 17454 050130 CPA TLSTR      LIST?
0179 17455 063516 LDA LMODE     YES
0180 17456 102600 OTA TTY      SET TTY TO OUTPUT MODE
0181 17457 074000 TP.2 STB TTY    PUT NOP INTO INTERRUPT CELL
0182 17460 017622 TP.3 JSB GETCH  GET NEXT CHARACTER
0183 17461 027502 JMP TP.8      BUFFER EMPTY
0184 17462 102600 TP.4 OTA TTY    LOAD TTY BOARD BUFFER
0185 17463 103700 STC TTY,C     GIVE PRINT COMMAND
0186 17464 102300 TP.5 SFS TTY    WAIT FOR
0187 17465 027464 JMP *-1      FLAG
0188 17466 063517 LDA TEMPI
0189 17467 002003 SZA,RSS      IS INTERRUPT ENABLED?
0190 17470 027460 JMP TP.3      NO
0191*
0192*   THIS SECTION CHECKS IF A CHARACTER HAS BEEN TYPED FROM THE
0193*   KEYBOARD DURING OUTPUT ON TELETYPE.
0194*
0195 17471 102500 TP.6 LIA TTY      LOAD FROM BOARD BUFFER
0196 17472 003000 CMA          FIRST 8 BITS SHOULD BE 1'S
0197 17473 013666 AND B177
0198 17474 002003 SZA,RSS
0199 17475 027460 JMP TP.3      NO KEY STRUCK, CONTINUE
0200 17476 063671 LDA IORI
0201 17477 073633 STA FINSH+1  RESTORE IOR INSTRUCTION
0202 17500 106700 TP.7 CLC TTY    TURN OFF TTY
0203 17501 114105 JSB I.STP,I  GO TO STOP

```

PAGE 0021 #02 BASIC SYSTEM TELETYPE OUTPUT DRIVER

|       |       |        |       |             |                                 |
|-------|-------|--------|-------|-------------|---------------------------------|
| 0204  | 17502 | 106700 | TP.8  | CLC TTY     | TURN OFF TTY                    |
| 0205  | 17503 | 063517 |       | LDA TEMPI   |                                 |
| 0206  | 17504 | 053536 |       | CPA TT.II   | IS INTERRUPT MODE SET?          |
| 0207  | 17505 | 017527 |       | JSB I.ON    | YES, RE-ENABLE KEYBOARD         |
| 0208  | 17506 | 063671 |       | LDA IORI    |                                 |
| 0209  | 17507 | 073633 |       | STA FINSH+1 | RESTORE IOR INSTRUCTION         |
| 0210  | 17510 | 002141 |       | SEZ,CLE,RSS | RECORD COMPLETE? CLEAR E        |
| 0211  | 17511 | 127445 |       | JMP TTY.P,I | E=0, RECORD OUTPUT COMPLETE     |
| 0212  | 17512 | 063655 |       | LDA M2      | E=1, ADD A RETURN AND LINE FEED |
| 0213  | 17513 | 067672 |       | LDB CRLFA   | LOAD ADDRESS OF CR AND LF       |
| 0214  | 17514 | 027446 |       | JMP TTY.P+1 | DO CR/LF                        |
| 0215* |       |        |       |             |                                 |
| 0216  | 17515 | 110000 | PMODE | OCT 110000  | PUNCH ONLY (ASR 35)             |
| 0217  | 17516 | 120000 | LMODE | OCT 120000  | LIST ONLY (ASR 35)              |
| 0218* |       |        |       |             |                                 |
| 0219  | 17517 | 000000 | TEMPI | NOP         |                                 |

0221\*

0222\* THIS ROUTINE TURNS OFF THE TELETYPE INTERRUPT MODE

0223\*

|      |       |        |       |             |                                |
|------|-------|--------|-------|-------------|--------------------------------|
| 0224 | 17520 | 000000 | I.OFF | NOP         |                                |
| 0225 | 17521 | 002400 |       | CLA         |                                |
| 0226 | 17522 | 070000 | TI.5  | STA TTY     | SET NOP INTO INTERRUPT CELL    |
| 0227 | 17523 | 106700 |       | CLC TTY     | TURN OFF READ MODE             |
| 0228 | 17524 | 000000 | R.CFF | NOP         | SET TO CLC RDR IF RDR EXISTS   |
| 0229 | 17525 | 000000 | P.CFF | NOP         | SET TO CLC PNCH IF PNCH EXISTS |
| 0230 | 17526 | 127520 |       | JMP I.OFF,I | RETURN                         |

0232\*

0233\* THIS ROUTINE TURNS ON THE TELETYPE INTERRUPT MODE

0234\*

|       |       |        |       |             |                             |
|-------|-------|--------|-------|-------------|-----------------------------|
| 0235  | 17527 | 000000 | I.ON  | NOP         |                             |
| 0236  | 17530 | 063536 |       | LDA TT.II   |                             |
| 0237  | 17531 | 070000 | TI.6  | STA TTY     | SET JSB INTO INTERRUPT CELL |
| 0238  | 17532 | 063444 |       | LDA IMODE   |                             |
| 0239  | 17533 | 102600 | TI.7  | OTA TTY     | SET TTY TO INPUT MODE       |
| 0240  | 17534 | 103700 |       | STC TTY,C   | SET TTY TO LOOK FOR INPUT   |
| 0241  | 17535 | 127527 |       | JMP I.ON,I  | RETURN                      |
| 0242* |       |        |       |             |                             |
| 0243  | 17536 | 114105 | TT.II | JSB I.STP,I | INTERRUPT LOCATION CODE     |

```

0245*
0246* CHARACTER PROCESSING SECTION FOR TTY AND PHOTOREADER
0247*
0248* CALL: JSB PROCS
0249* (A) HOLDS CHARACTER
0250*
0251* RETURN: F+1 - GET NEXT CHARACTER
0252* F+2 - RECORD COMPLETE
0253*
0254 17537 000000 PRCCS NOP
0255 17540 013666 AND B177 STRIP BIT 7
0256 17541 002003 SZA,RSS NULL?
0257 17542 127537 JMP PROCS,I YES, IGNORE
0258 17543 053656 CPA .2 NO, CONTROL B ?
0259 17544 127537 JMP PROCS,I YES, IGNORE
0260 17545 053657 CPA .3 NO, CONTROL C ?
0261 17546 127537 JMP PROCS,I YES, IGNORE
0262 17547 053660 CPA LNFD NO, LINE FEED?
0263 17550 127537 JMP PROCS,I YES, IGNORE
0264 17551 053666 CPA B177 NO, RUBOUT?
0265 17552 127537 JMP PROCS,I YES, IGNORE
0266 17553 053665 CPA AMODE NO, ALT MODE?
0267 17554 027616 JMP CMPLT-1 YES, CANCEL RECORD
0268 17555 053664 CPA OMODE NO, OLD ALT MODE?
0269 17556 027616 JMP CMPLT-1 YES, CANCEL RECORD
0270 17557 053662 CPA EMODE NO, ESCAPE MODE?
0271 17560 027616 JMP CMPLT-1 YES, CANCEL RECORD
0272 17561 053661 CPA CRTN NO, CARRIAGE RETURN?
0273 17562 027617 JMP CMPLT YES, COMPLETE RECORD
0274 17563 057676 CPB COUNT NO, BUFFER OVERFLOW?
0275 17564 007400 CCB YES, LOOK FOR CARRIAGE RETURN
0276 17565 006020 SSB LOOKING FOR CARRIAGE RETURN?
0277 17566 127537 JMP PROCS,I YES, RETURN
0278 17567 053663 CPA LFTAR NO, LEFT ARROW?
0279 17570 027602 JMP DLETE YES, DELETE PREVIOUS CHARACTER
0280 17571 006014 SLB,INB NO, CHECK ODD/EVEN FLAG
0281 17572 027576 JMP PROC2 B0 = 0, EVEN CHARACTER
0282 17573 001727 PRCC1 ALF,ALF B0 = 1, ODD CHARACTER
0283 17574 173675 STA BADDR,I RECORD HIGH CHARACTER
0284 17575 127537 JMP PROCS,I
0285 17576 133675 PRCC2 IOR BADDR,I PACK TWO CHARACTERS
0286 17577 173675 STA BADDR,I PUT IN BUFFER
0287 17600 037675 ISZ BADDR INDEX BUFFER ADDRESS POINTER
0288 17601 127537 JMP PROCS,I

```



0290\*

0291\* THIS SECTION DELETES PREVIOUS CHARACTER(S)

0292\*

|      |       |        |        |             |                              |
|------|-------|--------|--------|-------------|------------------------------|
| 0293 | 17602 | 006003 | DELETE | SZB,RSS     | IS BUFFER EMPTY?             |
| 0294 | 17603 | 127537 |        | JMP PROCS,I | YES, RETURN                  |
| 0295 | 17604 | 003400 |        | CCA         | NO                           |
| 0296 | 17605 | 044000 |        | ADB 0       | DECREMENT CHARACTER COUNT    |
| 0297 | 17606 | 006011 |        | SLB,RSS     | LOW CHARACTER?               |
| 0298 | 17607 | 127537 |        | JMP PROCS,I | YES                          |
| 0299 | 17610 | 043675 |        | ADA BADDR   | NO, DECREMENT                |
| 0300 | 17611 | 073675 |        | STA BADDR   | ADDRESS POINTER              |
| 0301 | 17612 | 163675 |        | LDA BADDR,I | GET LAST TWO CHARACTERS      |
| 0302 | 17613 | 001727 |        | ALF,ALF     |                              |
| 0303 | 17614 | 013666 |        | AND B177    | DELETE LAST CHARACTER        |
| 0304 | 17615 | 027573 |        | JMP PROC1   | STORE NEXT-TO-LAST CHARACTER |

0305\*

0306\* THIS SECTION PUTS COUNT IN A AND RETURNS TO P+2

0307\*

|      |       |        |       |             |                          |
|------|-------|--------|-------|-------------|--------------------------|
| 0308 | 17616 | 067655 |       | LDB M2      | SET DELETE FLAG          |
| 0309 | 17617 | 060001 | CMPLT | LDA 1       | PUT CHARACTER COUNT IN A |
| 0310 | 17620 | 037537 |       | ISZ PROCS   |                          |
| 0311 | 17621 | 127537 |       | JMP PROCS,I |                          |

0313\*

0314\* SUBROUTINE GETCH

0315\*

0316\* RETURN TO P+1 ON EMPTY BUFFER  
 0317\* IF THE BUFFER IS NOT EMPTY, ELSE  
 0318\* RETURN TO P+2 WITH CHARACTER IN (A).

0319\*

|      |       |        |       |             |                                  |
|------|-------|--------|-------|-------------|----------------------------------|
| 0320 | 17622 | 000000 | GETCH | NOP         |                                  |
| 0321 | 17623 | 057676 |       | CPB COUNT   |                                  |
| 0322 | 17624 | 127622 |       | JMP GETCH,I | BUFFER EMPTY, P+1 RETURN         |
| 0323 | 17625 | 163675 |       | LDA BADDR,I | GET TWO CHARACTERS               |
| 0324 | 17626 | 006011 |       | SLB,RSS     |                                  |
| 0325 | 17627 | 001727 |       | ALF,ALF     | B EVEN, POSITION CHARACTER RIGHT |
| 0326 | 17630 | 006014 |       | SLB,INB     | CHECK O/E, AND INDEX COUNT       |
| 0327 | 17631 | 037675 |       | ISZ BADDR   | B ODD, INCREMENT ADDRESS POINTER |
| 0328 | 17632 | 013666 | FINSH | AND B177    | STRIP LEFT CHARACTER             |
| 0329 | 17633 | 033667 |       | IOR B200    | ADD BIT 7                        |
| 0330 | 17634 | 037622 |       | ISZ GETCH   |                                  |
| 0331 | 17635 | 127622 |       | JMP GETCH,I | RETURN TO P+2                    |

0333\*

0334\* INITIALIZES FOR OUTPUTTING A RECORD

0335\*

|      |       |        |      |             |                             |
|------|-------|--------|------|-------------|-----------------------------|
| 0336 | 17636 | 000000 | INIT | NOP         |                             |
| 0337 | 17637 | 002320 |      | CCE,SSA     | SET E=1, CHECK FOR (A) < 0  |
| 0338 | 17640 | 003104 |      | CMA,CLE,INA | SET (E) = 0, (A) = -(A)     |
| 0339 | 17641 | 073676 |      | STA COUNT   | SAVE CHARACTER COUNT        |
| 0340 | 17642 | 077675 |      | STB BADDR   | SET BUFFER STARTING ADDRESS |
| 0341 | 17643 | 002002 |      | SZA         |                             |
| 0342 | 17644 | 006002 |      | SZB         | LEADER/TRAILER ONLY?        |
| 0343 | 17645 | 027651 |      | JMP ++4     | NO                          |
| 0344 | 17646 | 063670 |      | LDA CLAI    | YES, (B) = 0                |
| 0345 | 17647 | 073633 |      | STA FINSH+1 | SET CLEAR INSTRUCTION       |
| 0346 | 17650 | 000040 |      | CLE         | SET NO CR/LF                |
| 0347 | 17651 | 006400 |      | CLB         | INITIALIZE OUTPUT COUNT     |
| 0348 | 17652 | 127636 |      | JMP INIT,I  |                             |

0350\*

0351\* COMMUN DRIVER CONSTANTS AND ADDRESSES

0352\*

0353 17653 177765 M11 DEC -11

0354 17654 177775 M3 DEC -3

0355 17655 177776 M2 DEC -2

0356 17656 000002 .2 DEC 2

0357 17657 000003 .3 DEC 3

0358 17660 000012 LNFD OCT 12

LINE FEED

0359 17661 000015 CRIN OCT 15

CARRIAGE RETURN

0360 17662 000033 EMCDE OCT 33

ESCAPE

0361 17663 000137 LFTAR OCT 137

LEFT ARROW

0362 17664 000175 OMCDE OCT 175

OBSOLETE ALT MODE

0363 17665 000176 AMCDE OCT 176

ALT MODE

0364 17666 000177 B177 OCT 177

RUBOUT

0365 17667 000200 B200 OCT 200

0366 17670 002400 CLAI CLA

0367 17671 033667 IORI IOR B200

ADD IN BIT 7

0368\*

0369 17672 017673 CRLFA DEF CRLF

0370 17673 106612 CRLF OCT 106612

0371\*

0372 17674 000000 BUFSA NOP

INITIAL BUFFER ADDRESS

0373 17675 000000 BALDR NOP

CURRENT BUFFER ADDRESS

0374 17676 000000 COLNT NOP

HOLDS RECORD LENGTH

0375 17677 000000 EOTC NOP

END-OF-TAPE COUNTER

0376\*

0377\* BASE PAGE REFERENCE ENTRIES

0378\*

0379 00101 ORG 101B

0380 00101 100105 DEF 1.STP,1

READER LINK INITIALIZED TO STOP

0381 00102 017445 DEF TTY.P

TTY OUTPUT ENTRY ADDRESS

0382 00103 100102 DEF 102B,1

PUNCH LINK INITIALIZED TO TTY

0383 00104 017426 DEF TTY.1

TTY INPUT ENTRY ADDRESS

0384 00105 000000 1.STP NOP

LINK TO STOP ROUTINE

0385 00106 000000 LWBM NOP

LAST WORD OF USER SPACE

0386 00107 000000 NOP

0387 00110 000135 FWAM DEF 135B

FIRST WORD OF AVAILABLE MEMORY

0388 00111 017425 LWAM DEF TTY.1-1

LAST WORD OF AVAILABLE MEMORY

0389\*

0390 00123 ORG 123B

0391 00123 017520 IMCFF DEF 1.OFF

DISABLE KEYBOARD INTERRUPT

0392 00124 017527 IMCN DEF 1.ON

SET KEYBOARD INTERRUPT

0393 00125 017424 TLINK DEF 1.TTY+2000B

TTY INPUT INTERRUPT LINK

0394 00126 100103 PLSTR DEF 103B,1

PLIST OUTPUT ADDRESS

0395 00127 100102 LISTR DEF 102B,1

LIST DEVICE LINK

0396 00130 100102 TLSTR DEF 102B,1

LIST OUTPUT ADDRESS

0397\*

0398 00117 SYMTA EQU 117B

0399 00131 IOBFA EQU 131B

BUFFER ADDRESS

0400 00134 SBLFA EQU 134B

SYNTAX BUFFER ADDRESS

0401 00000 RDR EQU 0

0402 00000 PNCH EQU 0

0403 00000 TTY EQU 0

0404 00001 TTYI EQU TTY+1

```

0002*
0003*  MODIFY PBS FOR SERIAL TELETYPE
0004*
0005  15073                      ORG 15073B
0006*
0007  15073 063653  SRJAL LDA SM11      SET
0008  15074 067302          LDB LST5A      TTY PUNCH
0009  15075 117257          JSB SETIA,I      ADDRESSES
0010  15076 137260          ISZ IOADA,I      INCREMENT SELECT CODE
0011  15077 063262          LDA SM5      SET
0012  15100 067310          LDB LST6A      TTY READER
0013  15101 117257          JSB SETIA,I      ADDRESSES
0014  15102 063263          LDA TT.IS      SET INTERRUPT
0015  15103 070001  T16     STA TTYI      CELL
0016*
0017  15104 063241          LDA TTYPI      SET OUTPUT
0018  15105 173221          STA COR1A,I
0019  15106 173223          STA COR3A,I      TELETYPE CALLS
0020  15107 173224          STA DMP1A,I
0021  15110 173226          STA GETAA,I      TO SERIAL
0022  15111 173230          STA GET2A,I
0023  15112 173231          STA CRL1A,I      DRIVER
0024*
0025  15113 063243          LDA STF0      SET INPUT
0026  15114 173222          STA COR2A,I
0027  15115 173227          STA GET1A,I      TELETYPE CALLS
0028  15116 037222          ISZ COR2A
0029  15117 037227          ISZ GET1A      TO SERIAL
0030  15120 063242          LDA TTYII
0031  15121 173222          STA COR2A,I      DRIVER
0032  15122 173227          STA GET1A,I
0033  15123 037222          ISZ COR2A
0034  15124 037227          ISZ GET1A
0035  15125 063244          LDA CLF0
0036  15126 173222          STA COR2A,I
0037  15127 173227          STA GET1A,I
0038*
0039  15130 002400          CLA      CLEAR
0040  15131 173232          STA TP9A,I
0041  15132 037232          ISZ TP9A      BUFFERED TELETYPE
0042  15133 173232          STA TP9A,I
0043  15134 173233          STA TP10A,I      INSTRUCTIONS
0044  15135 173225          STA DMP2A,I
0045  15136 037225          ISZ DMP2A
0046  15137 173225          STA DMP2A,I
0047*
0048  15140 063245          LDA STOUA      SET FOR POSSIBLE
0049  15141 173234          STA TOUTA,I      TTY PUNCHING
0050*
0051  15142 063316          LDA LST7A      USE READER AND PUNCH
0052  15143 173237          STA PHRLA,I      DRIVERS IN
0053  15144 063324          LDA LST8A      SERIAL TELETYPE
0054  15145 173240          STA PNCLA,I      PACKAGE

```

|       |  |        |                   |                              |
|-------|--|--------|-------------------|------------------------------|
| 0056  | 15146  | 063246 | LDA ROFFA         | PREPARE TO SET               |
| 0057  | 15147  | 173217 | STA PHR1A,I       | INTERRUPT-OFF INSTRUCTIONS   |
| 0058  | 15150  | 063247 | LDA POFFA         | IN SERIAL TELETYPE           |
| 0059  | 15151  | 173220 | STA NOR1A,I       | PACKAGE                      |
| 0060* |  |        |                   |                              |
| 0061  | 15152  | 063250 | LDA SLWMT         | SET SERIAL                   |
| 0062  | 15153  | 070111 | STA LWAM          |                              |
| 0063  | 15154  | 063251 | LDA SLWMR         | TELETYPE VALUES              |
| 0064  | 15155  | 173235 | STA LWMRA,I       |                              |
| 0065  | 15156  | 063252 | LDA SLWMP         | IN LWAM CONSTANTS            |
| 0066  | 15157  | 173236 | STA LWMPA,I       |                              |
| 0067  | 15160  | 063253 | LDA STTYP         |                              |
| 0068  | 15161  | 070102 | STA 102B          |                              |
| 0069  | 15162  | 063254 | LDA STTYI         |                              |
| 0070  | 15163  | 070104 | STA 104B          |                              |
| 0071  | 15164  | 063255 | LDA SIOFF         |                              |
| 0072  | 15165  | 070123 | STA IMOFF         |                              |
| 0073  | 15166  | 063256 | LDA SION          |                              |
| 0074  | 15167  | 070124 | STA IMON          |                              |
| 0075* |  |        |                   |                              |
| 0076* | OVERLAY PARALLEL DRIVERS WITH SERIAL DRIVERS |        |                   |                              |
| 0077* |  |        |                   |                              |
| 0078  | 15170  | 163264 | SRIA1 LDA MOVES,I | MOVE A                       |
| 0079  | 15171  | 173265 | STA DESTS,I       | WORD                         |
| 0080  | 15172  | 037264 | ISZ MOVES         | BUMP                         |
| 0081  | 15173  | 037265 | ISZ DESTS         | POINTERS                     |
| 0082  | 15174  | 037266 | ISZ SMCNT         | SERIAL DRIVERS MOVED?        |
| 0083  | 15175  | 027170 | JMP SRIA1         | NO                           |
| 0084  | 15176  | 127261 | JMP PHRDA,I       | YES, RETURN TO MAIN SEQUENCE |

|       |  |        |               |                        |
|-------|--|--------|---------------|------------------------|
| 0086* |  |        |               |                        |
| 0087* | SUBROUTINE (STOUT) TO OUTPUT ONE CHARACTER TO THE  |        |               |                        |
| 0088* | TELETYPE. CHARACTER IS IN (A). (B) IS NOT ALTERED. |        |               |                        |
| 0089* |  |        |               |                        |
| 0090  | 15177  | 000000 | STOUT NOP     |                        |
| 0091  | 15200  | 073455 | STA TCHAR     |                        |
| 0092  | 15201  | 063653 | LDA SM11      | SET BIT                |
| 0093  | 15202  | 073517 | STA BCNT      | COUNTER                |
| 0094  | 15203  | 063455 | LDA TCHAR     |                        |
| 0095  | 15204  | 001000 | ALS           | ADD                    |
| 0096  | 15205  | 033520 | IOR B3000     | CONTROL BITS           |
| 0097  | 15206  | 102700 | TP7 STC TTY   | TURN ON TELETYPE       |
| 0098  | 15207  | 103600 | TP8 OTA TTY,C | OUTPUT BIT             |
| 0099  | 15210  | 001300 | KAR           | POSITION NEXT BIT      |
| 0100  | 15211  | 102300 | TP9 SFS TTY   | WAIT FOR               |
| 0101  | 15212  | 027211 | JMP *-1       | COMPLETION FLAG        |
| 0102  | 15213  | 037517 | ISZ BCNT      | DONE?                  |
| 0103  | 15214  | 027207 | JMP TP8       | NO                     |
| 0104  | 15215  | 106700 | TP10 CLC TTY  | YES, TURN OFF TELETYPE |
| 0105  | 15216  | 127177 | JMP STOUT,I   |                        |

0107\*

0108\* MODIFICATION ADDRESSES

0109\*

|      |       |        |       |     |         |
|------|-------|--------|-------|-----|---------|
| 0110 | 15217 | 016364 | PHR1A | DEF | PHRD1   |
| 0111 | 15220 | 016402 | NOR1A | DEF | NORD1   |
| 0112 | 15221 | 016424 | COR1A | DEF | CORA1   |
| 0113 | 15222 | 016427 | COR2A | DEF | CORA2   |
| 0114 | 15223 | 016453 | COR3A | DEF | CORA3   |
| 0115 | 15224 | 016551 | DMP1A | DEF | DUMP1   |
| 0116 | 15225 | 016552 | DMP2A | DEF | DUMP2   |
| 0117 | 15226 | 016572 | GETAA | DEF | GETAD+1 |
| 0118 | 15227 | 016575 | GET1A | DEF | GETA1   |
| 0119 | 15230 | 016607 | GET2A | DEF | GETA2   |
| 0120 | 15231 | 016644 | CRL1A | DEF | CRLF1   |
| 0121 | 15232 | 016700 | TP9A  | DEF | TP.9-1  |
| 0122 | 15233 | 016731 | TP10A | DEF | TP.10   |
| 0123 | 15234 | 017245 | TOUTA | DEF | PNCHO   |
| 0124 | 15235 | 017247 | LWPA  | DEF | LWAMP   |
| 0125 | 15236 | 017250 | LWMPA | DEF | LWAMP   |
| 0126 | 15237 | 017310 | PHRLA | DEF | LST2A   |
| 0127 | 15240 | 017317 | PNCLA | DEF | LST3A   |

0128\*

0129\* MODIFICATION INSTRUCTIONS

0130\*

|      |       |        |       |     |               |
|------|-------|--------|-------|-----|---------------|
| 0131 | 15241 | 017466 | TTYPI | JSB | .TTYP         |
| 0132 | 15242 | 017404 | TTYII | JSB | .TTYI         |
| 0133 | 15243 | 102100 | STF0  | STF | 0             |
| 0134 | 15244 | 103100 | CLF0  | CLF | 0             |
| 0135 | 15245 | 015177 | STCUA | DEF | STOUT         |
| 0136 | 15246 | 073524 | ROFFA | STA | .ROFF         |
| 0137 | 15247 | 073525 | POFFA | STA | .POFF         |
| 0138 | 15250 | 017403 | SLWMT | DEF | .TTYI-1+2000B |
| 0139 | 15251 | 017345 | SLWMR | DEF | HSPR-1+2000B  |
| 0140 | 15252 | 017324 | SLWMP | DEF | SPNCH-1+2000B |
| 0141 | 15253 | 017466 | STTYP | DEF | .TTYP+2000B   |
| 0142 | 15254 | 017404 | STTYI | DEF | .TTYI+2000B   |
| 0143 | 15255 | 017521 | SICFF | DEF | .IOFF+2000B   |
| 0144 | 15256 | 017531 | SICN  | DEF | .ION+2000B    |

LWAM OPTIONS  
FOR SERIAL  
TELETYPE

0145\*

0146\* COMMUNICATION LINKS

0147\*

|      |       |        |       |     |       |
|------|-------|--------|-------|-----|-------|
| 0148 | 15257 | 016646 | SET1A | DEF | SET1  |
| 0149 | 15260 | 017244 | IOADA | DEF | IOADR |
| 0150 | 15261 | 016353 | PHRDA | DEF | PHRDR |

0151\*

0152\* LOCAL CONSTANTS AND ADDRESSES

0153\*

|      |       |        |       |     |                                   |
|------|-------|--------|-------|-----|-----------------------------------|
| 0154 | 15262 | 177773 | SM5   | DEC | -5                                |
| 0155 | 15263 | 114125 | TT.IS | JSB | TLINK,I TTY INTERRUPT INSTRUCTION |
| 0156 | 15264 | 015325 | MOVES | DEF | SPNCH                             |
| 0157 | 15265 | 017325 | DESTS | DEF | SPNCH+2000B                       |
| 0158 | 15266 | 177566 | SMCNT | ABS | SPNCH-SPROC                       |

```

0160*
0161* TELETYPE OUTPUT INSTRUCTION LIST
0162*
0163 15267 015476 LIST5 DEF TP2-1
0164 15270 015477 DEF TP2
0165 15271 015501 DEF TP2+2
0166 15272 015505 DEF TP3-1
0167 15273 015506 DEF TP3
0168 15274 015456 DEF TP5
0169 15275 015523 DEF TP6
0170 15276 015206 DEF TP7
0171 15277 015207 DEF TP8
0172 15300 015211 DEF TP9
0173 15301 015215 DEF TP10
0174*
0175 15302 015267 LST5A DEF LIST5
0176*
0177* TELETYPE INPUT INSTRUCTION LIST
0178*
0179 15303 015426 LIST6 DEF TI2
0180 15304 015437 DEF TI3
0181 15305 015462 DEF TI4
0182 15306 015522 DEF TI5
0183 15307 015103 DEF TI6
0184*
0185 15310 015303 LST6A DEF LIST6
0186*
0187* PHOTOREADER INSTRUCTION LIST
0188*
0189 15311 017365 LIST7 DEF PR.3+2000B
0190 15312 017371 DEF PR.5+2000B
0191 15313 017373 DEF PR.6+2000B
0192 15314 017400 DEF PR.7+2000B
0193 15315 017307 DEF RU
0194*
0195 15316 015311 LST7A DEF LIST7
0196*
0197* HIGH-SPEED PUNCH INSTRUCTION LIST
0198*
0199 15317 017331 LIST8 DEF PN.2+2000B
0200 15320 017332 DEF PN.3+2000B
0201 15321 017333 DEF PN.4+2000B
0202 15322 017340 DEF PN.6+2000B
0203 15323 017316 DEF PO
0204*
0205 15324 015317 LST8A DEF LIST8

```

PAGE 0030 #03 BASIC SYSTEM HIGH SPEED PUNCH DRIVER

```

0207*
0208***** BASIC SYSTEM HIGH SPEED PUNCH DRIVER *****
0209*
0210*   OUTPUTS ASCII THROUGH THE HIGH SPEED PUNCH
0211*
0212*   CALL:   JSB 1038,I
0213*
0214*           (A) = NUMBER OF CHARACTERS TO BE PUNCHED
0215*           (B) = STARTING ADDRESS OF BUFFER
0216*
0217*
0218*   IF (A) IS >= 0 THEN OUTPUT (A) CHARACTERS
0219*   FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0220*
0221*   IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0222*
0223*   BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0224*
0225*   IF (B) = 0 ON ENTRY (A) FEED FRAMES ARE PUNCHED.
0226*   IF (A) = 0 ON ENTRY ONLY A CR/LF IS PUNCHED.
0227*
0228*
0229  15325 000000  SPNCH NOP
0230  15326 017636      JSB SINIT      INITIALIZE FOR PUNCHING
0231  15327 017622  PN.1 JSB SGTCH      GET NEXT CHARACTER FROM BUFFER
0232  15330 027336      JMP PN.5        BUFFER EMPTY
0233  15331 102600  PN.2 OTA PNCH        LOAD PUNCH BUFFER
0234  15332 103700  PN.3 STC PNCH,C      GIVE PUNCH COMMAND
0235  15333 102300  PN.4 SFS PNCH
0236  15334 027333      JMP *-1          WAIT FOR PUNCH READY
0237  15335 027327      JMP PN.1        GET NEXT CHARACTER
0238*
0239  15336 063671  PN.5 LDA SIORI
0240  15337 073633      STA SFNSH+1     RESTORE IOR INSTRUCTION
0241  15340 106700  PN.6 CLC PNCH        TURN OFF PUNCH
0242  15341 002141      SEZ,CLE,RSS     RECORD COMPLETE? CLEAR E
0243  15342 127325      JMP SPNCH,I     E=0, OUTPUT COMPLETE
0244  15343 063655      LDA SM2         E=1, APPEND CR AND LF
0245  15344 067672      LDB SCRLA       LOAD ADDRESS OF CR AND LF
0246  15345 027326      JMP SPNCH+1     DO CR/LF

```



```

0248*
0249***** BASIC SYSTEM PHOTO READER DRIVER *****
0250*
0251*  INPUTS TAPE RECCRDS THROUGH THE PHOTO READER
0252*
0253*  CALL:  JSB 101B,I
0254*
0255*          (A) =  MAXIMUM NUMBER CHARS IN RECORD
0256*          (B) =  BUFFER STARTING ADDRESS
0257*
0258*  ON RETURN  (A)= -1  TOO MANY CHARACTERS IN RECORD
0259*             (A)= -2  END OF TAPE DETECTED
0260*             (A)= -3  NO TAPE OR GATE DOWN
0261*             (A)=  NUMBER OF CHARACTERS IN RECORD
0262*
0263*          INPUT IS PACKED TWO CHARACTERS PER WORD IN BUFFER.
0264*
0265*          ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.
0266*          THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.
0267*
0268*          THE LEFT ARROW(S) - DELETE THE PREVIOUS CHARACTER(S).
0269*
0270*          AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL
0271*          CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.
0272*
0273*          IF 10 NULL CHARACTERS ARE DETECTED BEFORE ANY CHARACTER,
0274*          READING IS TERMINATED AND THE RETURN IS WITH A NULL RECORD.
0275*
0276*
0277 15346 000000  HSPR  NOP
0278 15347 073676          STA SCNT          SAVE LENGTH
0279 15350 077674          STB SBFSA          SAVE BUFFER STARTING ADDRESS
0280 15351 063653  PR.1  LDA SM11
0281 15352 073677          STA SEOTC          INITIALIZE EOT COUNTER
0282 15353 067674          LDH SBFSA
0283 15354 077675          STB SBDDR          INITIALIZE BUFFER POINTER
0284 15355 006400          CLB              INITIALIZE CHARACTER COUNT
0285 15356 006003  PR.2  SZB,RSS          ANY NON-NULL CHARACTERS YET?
0286 15357 002002          SZA              NO, SKIP IF NULL
0287 15360 027365          JMP PR.3
0288 15361 037677          ISZ SEOTC          COUNT NULL
0289 15362 027365          JMP PR.3          NOT 10 NULLS
0290 15363 063655          LDA SM2          SET A TO INDICATE EOT (-2)
0291 15364 027400          JMP PR.7          10 NULLS, TURN OFF READER & EXIT
0292 15365 103700  PR.3  STC RDR,C          REQUEST CHARACTER
0293 15366 002400          CLA              SET DELAY COUNT
0294 15367 002007  PR.4  INA,SZA,RSS      DELAY = 6.4 * 65K = .41 SECONDS
0295 15370 027402          JMP PR.8          (A)=0, NO TAPE OR GATE DOWN
0296 15371 102300  PR.5  SFS RDR
0297 15372 027367          JMP PR.4          NO FLAG, CHECK DELAY COUNT
0298 15373 103500  PR.6  LIA RDR,C          LOAD CHARACTER
0299 15374 017537          JSB SPROC          PROCESS CHARACTER
0300 15375 027356          JMP PR.2          GET NEXT CHARACTER
0301 15376 057655          CPB SM2          RUBOUT IN THIS RECORD?
0302 15377 027351          JMP PR.1          YES, IGNORE RECORD
0303 15400 106700  PR.7  CLC RDR          TURN OFF READER

```

PAGE 0032 #03 BASIC SYSTEM HIGH SPEED PHOTO READER DRIVER

```
0304 15401 127346      JMP HSPR,I
0305*
0306 15402 063654  PR.8  LDA SM3      LOAD 'NO TAPE' STATUS
0307 15403 027400      JMP PR.7
```

PAGE 0033 #03 BASIC SYSTEM TELETYPE INPUT DRIVER

0309\*

0310\*\*\*\*\* BASIC SYSTEM TELETYPE INPUT DRIVER \*\*\*\*\*

0311\*

0312\* INPUTS FROM AN ASR 33/35 THROUGH THE  
0313\* TELETYPE CONTRL BOARD FROM TAPE OR KEYBOARD.

0314\*

0315\* CALL: JSB 1048,I

0316\*

0317\* (A) = MAXIMUM NUMBER CHARS IN RECORD

0318\* (B) = BUFFER STARTING ADDRESS

0319\*

0320\* RETURN: (A)= -1 TOO MANY CHARACTERS IN RECORD

0321\* (A)= -2 RECORD DELETED

0322\* (A)= NUMBER OF CHARACTERS IN RECORD

0323\*

0324\*

0325\* THE CHARACTERS ARE PACKED TWO TO A WORD IN THE BUFFER.

0326\*

0327\* ALL RECORDS MUST BE TERMINATED WITH A LINE FEED.  
0328\* THE NULL AND CARRIAGE RETURN CHARACTERS ARE IGNORED.

0329\*

0330\* THE LEFT ARROW(S) - DELETE THE PREVIOUS CHARACTER(S).

0331\*

0332\* AN ALT MODE ANYWHERE BEFORE THE LINE FEED DELETES ALL  
0333\* CHARACTERS IN THE RECORD. THE RECORD IS IGNORED.

0334\*

0335\*

|      |       |        |       |             |                                |
|------|-------|--------|-------|-------------|--------------------------------|
| 0336 | 15404 | 000000 | .TTYI | NOP         |                                |
| 0337 | 15405 | 073676 |       | STA SCNT    | SAVE LENGTH                    |
| 0338 | 15406 | 077675 |       | STB SBDDR   | SAVE BUFFER ADDRESS            |
| 0339 | 15407 | 006400 |       | CLB         | ZERO CHARACTER COUNT           |
| 0340 | 15410 | 063456 |       | LDA TP5     | SET                            |
| 0341 | 15411 | 073434 |       | STA OUTB    | ECHO                           |
| 0342 | 15412 | 017457 | TI1   | JSB TTINT   | INITIALIZE FOR INPUT CHARACTER |
| 0343 | 15413 | 063454 |       | LDA BITS    | WAIT FOR                       |
| 0344 | 15414 | 002002 |       | SZA         | CHARACTER                      |
| 0345 | 15415 | 027413 |       | JMP *-2     | COMPLETE                       |
| 0346 | 15416 | 063455 |       | LDA TCHAR   | PROCESS                        |
| 0347 | 15417 | 017537 |       | JSB SPROC   | CHARACTER                      |
| 0348 | 15420 | 027412 |       | JMP TI1     | GET NEXT CHARACTER             |
| 0349 | 15421 | 006400 |       | CLB         | CLEAR                          |
| 0350 | 15422 | 077434 |       | STB OUTB    | ECHO                           |
| 0351 | 15423 | 127404 |       | JMP .TTYI,I |                                |

PAGE 0034 #03 BASIC SYSTEM TELETYPE INPUT DRIVER

0353\*

0354\* THIS SECTION PROCESSES EACH BIT AS IT BECOMES AVAILABLE.  
0355\* RETURN THROUGH 105B IF THE INTERRUPT MODE FLAG IS SET UPON  
0356\* CHARACTER COMPLETION.

0357\*

|      |       |        |       |             |                    |
|------|-------|--------|-------|-------------|--------------------|
| 0358 | 15424 | 000000 | I.TTY | NOP         |                    |
| 0359 | 15425 | 073453 |       | STA ATEMP   | SAVE (A)           |
| 0360 | 15426 | 103501 | TI2   | LIA TTYI,C  | MERGE              |
| 0361 | 15427 | 033455 |       | IOR TCHAR   | NEW BIT            |
| 0362 | 15430 | 001300 |       | RAR         | INTO               |
| 0363 | 15431 | 073455 |       | STA TCHAR   | CHARACTER          |
| 0364 | 15432 | 001727 |       | ALF,ALF     | POSITION BIT       |
| 0365 | 15433 | 001222 |       | RAL,RAL     | FOR ECHO           |
| 0366 | 15434 | 000000 | OUTB  | NOP         | OUTPUT INSTRUCTION |
| 0367 | 15435 | 037454 |       | ISZ BITS    | BIT 11?            |
| 0368 | 15436 | 027451 |       | JMP EXIT    | NO                 |
| 0369 | 15437 | 106701 | TI3   | CLC TTYI    | YES                |
| 0370 | 15440 | 063455 |       | LDA TCHAR   | ALIGN              |
| 0371 | 15441 | 001723 |       | ALF,RAR     | COMPLETED          |
| 0372 | 15442 | 073455 |       | STA TCHAR   | CHARACTER          |
| 0373 | 15443 | 063536 |       | LDA STOPI   | STOP FLAG          |
| 0374 | 15444 | 002003 |       | SZA,RSS     | SET?               |
| 0375 | 15445 | 027451 |       | JMP EXIT    | NO                 |
| 0376 | 15446 | 063671 |       | LDA SIORI   | YES, RESTORE       |
| 0377 | 15447 | 073633 |       | STA SFNSH+1 | IOR INSTRUCTION    |
| 0378 | 15450 | 114105 |       | JSB I.STP,I | GO TO STOP         |
| 0379 | 15451 | 063453 | EXIT  | LDA ATEMP   | RESTORE (A)        |
| 0380 | 15452 | 127424 |       | JMP I.TTY,I |                    |

0381\*

|      |       |        |       |     |
|------|-------|--------|-------|-----|
| 0382 | 15453 | 000000 | ATEMP | NOP |
| 0383 | 15454 | 000000 | BITS  | NOP |
| 0384 | 15455 | 000000 | TCHAR | NOP |

0385\*

|      |       |        |     |         |                      |
|------|-------|--------|-----|---------|----------------------|
| 0386 | 15456 | 102600 | TP5 | OTA TTY | ECHO BIT INSTRUCTION |
|------|-------|--------|-----|---------|----------------------|

0388\*

0389\* THIS ROUTINE INITIALIZES THE SERIAL TELETYPE INPUT ROUTINE  
0390\* AND SETS TELETYPE TO ACCEPT INPUT.

0391\*

|      |       |        |       |             |                      |
|------|-------|--------|-------|-------------|----------------------|
| 0392 | 15457 | 000000 | TTINT | NOP         |                      |
| 0393 | 15460 | 063653 |       | LDA SM11    | SET                  |
| 0394 | 15461 | 073454 |       | STA BITS    | BIT COUNTER          |
| 0395 | 15462 | 103701 | TI4   | STC TTYI,C  | DEMAND INPUT         |
| 0396 | 15463 | 002400 |       | CLA         | ZERO OUT             |
| 0397 | 15464 | 073455 |       | STA TCHAR   | CHARACTER REPOSITORY |
| 0398 | 15465 | 127457 |       | JMP TTINT,I |                      |

```

0400*
0401***** BASIC SYSTEM TELETYPE OUTPUT DRIVER *****
0402*
0403*   OUTPUTS ASCII RECORDS THROUGH THE TELETYPE PRINTER,
0404*   PUNCH, OR BOTH.
0405*
0406*   CALL:   JSB 102B,I
0407*
0408*           (A) = NUMBER OF CHARACTERS TO BE OUTPUT
0409*           (B) = STARTING ADDRESS OF BUFFER
0410*
0411*
0412*   IF (A) IS >= 0 THEN OUTPUT (A) CHARACTERS
0413*   FOLLOWED BY A CARRIAGE RETURN-LINE FEED.
0414*
0415*   IF (A) < 0 THEN PUNCH -(A) CHARACTERS ONLY.
0416*
0417*   BUFFER CONTAINS ASCII CHARACTERS PACKED TWO PER WORD.
0418*
0419*   IF (B) = 0 ON ENTRY OUTPUT (A) FEED FRAMES.
0420*   IF (A) = 0 ON ENTRY ONLY A CR/LF IS OUTPUT.
0421*
0422*
0423 15466 000000 .TTYP NOP
0424 15467 017636 JSB SINIT      INITIALIZE FOR OUTPUT
0425 15470 063653 TP1  LDA SM11    SET BIT
0426 15471 073517 STA BCNT      COUNTER
0427 15472 017622 JSB SGTCH    FETCH NEXT CHARACTER FROM BUFFER
0428 15473 027510 JMP TP4      BUFFER EMPTY
0429 15474 001000 ALS          ADD BIT 7 AND
0430 15475 033520 IOR B3000      CONTROL BITS
0431 15476 102700 STC TTY      REQUEST PRINT
0432 15477 103600 TP2  OTA TTY,C   OUTPUT BIT
0433 15500 001300 RAR          POSITION NEXT BIT
0434 15501 102300 SFS TTY      WAIT FOR
0435 15502 027501 JMP *-1      BIT OUT FLAG
0436 15503 037517 ISZ BCNT      CHARACTER OUT?
0437 15504 027477 JMP TP2      NO
0438 15505 106700 CLC TTY      YES, TURN OFF TTY
0439 15506 102100 TP3  STF TTY      SET FLAG BUFFER (RESETS TIMER)
0440 15507 027470 JMP TP1
0441*
0442 15510 063671 TP4  LDA SIORI    RESTORE IOR
0443 15511 073633 STA SFNSH+1  INSTRUCTION
0444 15512 002141 SEZ,CLE,RSS  DONE?
0445 15513 127466 JMP .TTYP,I  YES
0446 15514 063655 LDA SM2      NO
0447 15515 067672 LDB SCRLA    DO CR/LF
0448 15516 027467 JMP .TTYP+1
0449*
0450 15517 000000 BCNT  NOP
0451 15520 003000 B3000 OCT 3000

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PAGE 0037 #03 CHARACTER PROCESSING SECTION FOR INPUT

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0476*
0477* CHARACTER PROCESSING SECTION FOR TTY AND PHOTOREADER
0478*
0479* CALL: JSB PROCS
0480* (A) HOLDS CHARACTER
0481*
0482* RETURN: P+1 - GET NEXT CHARACTER
0483* F+2 - RECORD COMPLETE
0484*
0485 15537 000000 SPROC NOP
0486 15540 013666 AND SB177 STRIP BIT 7
0487 15541 002003 SZA,RSS NULL?
0488 15542 127537 JMP SPROC,I YES, IGNORE
0489 15543 053656 CPA S,2 NO, CONTROL B?
0490 15544 127537 JMP SPROC,I YES, IGNORE
0491 15545 053657 CPA S,3 NO, CONTROL C?
0492 15546 127537 JMP SPROC,I YES, IGNORE
0493 15547 053660 CPA SLNFD NO, LINE FEED?
0494 15550 127537 JMP SPROC,I YES, IGNORE
0495 15551 053666 CPA SB177 NO, RUBOUT?
0496 15552 127537 JMP SPROC,I YES, IGNORE
0497 15553 053665 CPA SAMDE NO, ALT MODE?
0498 15554 027616 JMP SCMPL-1 YES, CANCEL RECORD
0499 15555 053664 CPA SOMDE NO, OLD ALT MODE?
0500 15556 027616 JMP SCMPL-1 YES, CANCEL RECORD
0501 15557 053662 CPA SEMDE NO, ESCAPE MODE?
0502 15560 027616 JMP SCMPL-1 YES, CANCEL RECORD
0503 15561 053661 CPA SCRTN NO, CARRIAGE RETURN?
0504 15562 027617 JMP SCMPL YES, COMPLETE RECORD
0505 15563 057676 CPB SCONT NO, BUFFER OVERFLOW?
0506 15564 007400 CCB YES, LOOK FOR CARRIAGE RETURN
0507 15565 006020 SSB LOOKING FOR CARRIAGE RETURN?
0508 15566 127537 JMP SPROC,I YES, RETURN
0509 15567 053663 CPA SLFTA NO, LEFT ARROW?
0510 15570 027602 JMP SDLTE YES, DELETE PREVIOUS CHARACTER
0511 15571 006014 SLB,INB NO, CHECK ODD/EVEN FLAG
0512 15572 027576 JMP SPRO2 B0 = 0, EVEN CHARACTER
0513 15573 001727 SPRO1 ALF,ALF B0 = 1, ODD CHARACTER
0514 15574 173675 STA SBDDR,I RECORD HIGH CHARACTER
0515 15575 127537 JMP SPROC,I
0516 15576 133675 SPRU2 IOR SBDDR,I PACK TWO CHARACTERS
0517 15577 173675 STA SBDDR,I PUT IN BUFFER
0518 15600 037675 ISZ SBDDR INDEX BUFFER ADDRESS POINTER
0519 15601 127537 JMP SPROC,I

```

PAGE 0036 #03 BASIC SYSTEM TELETYPE OUTPUT DRIVER

0453\*

0454\* THIS ROUTINE TURNS OFF THE TELETYPE INTERRUPT MODE

0455\*

|      |       |        |       |     |                                 |
|------|-------|--------|-------|-----|---------------------------------|
| 0456 | 15521 | 000000 | .ICFF | NOP |                                 |
| 0457 | 15522 | 106701 | TI5   | CLC | TTYI                            |
| 0458 | 15523 | 106700 | TP6   | CLC | TTY                             |
| 0459 | 15524 | 000000 | .RCFF | NOP | TURN OFF KEYBOARD               |
| 0460 | 15525 | 000000 | .PCFF | NOP | TURN OFF PRINTER                |
| 0461 | 15526 | 002400 |       | CLA | SET TO CLC RDR IF READER EXISTS |
| 0462 | 15527 | 073536 |       | STA | STOP FLAG                       |
| 0463 | 15530 | 127521 |       | JMP | .IOFF,I                         |

0465\*

0466\* THIS ROUTINE TURNS ON THE TELETYPE INTERRUPT MODE

0467\*

|       |       |        |       |     |                             |
|-------|-------|--------|-------|-----|-----------------------------|
| 0468  | 15531 | 000000 | .ICN  | NOP |                             |
| 0469  | 15532 | 003400 |       | CCA | SET STOP FLAG               |
| 0470  | 15533 | 073536 |       | STA | STOP FLAG                   |
| 0471  | 15534 | 017457 |       | JSB | TTINI                       |
| 0472  | 15535 | 127531 |       | JMP | .ION,I                      |
| 0473* |       |        |       |     |                             |
| 0474  | 15536 | 000000 | SICPI | NOP | STOP FLAG (INITIALIZED OFF) |

0521\*

0522\* THIS SECTION DELETES PREVIOUS CHARACTER(S)

0523\*

|      |       |        |       |             |                              |
|------|-------|--------|-------|-------------|------------------------------|
| 0524 | 15602 | 006003 | SDLTE | SZB,RSS     | IS BUFFER EMPTY?             |
| 0525 | 15603 | 127537 |       | JMP SPROC,I | YES, RETURN                  |
| 0526 | 15604 | 003400 |       | CCA         | NO                           |
| 0527 | 15605 | 044000 |       | ADB 0       | DECREMENT CHARACTER COUNT    |
| 0528 | 15606 | 006011 |       | SLB,RSS     | LOW CHARACTER?               |
| 0529 | 15607 | 127537 |       | JMP SPROC,I | YES                          |
| 0530 | 15610 | 043675 |       | ADA SBDDR   | NO, DECREMENT                |
| 0531 | 15611 | 073675 |       | STA SBDDR   | ADDRESS POINTER              |
| 0532 | 15612 | 163675 |       | LDA SBDDR,I | GET LAST TWO CHARACTERS      |
| 0533 | 15613 | 001727 |       | ALF,ALF     |                              |
| 0534 | 15614 | 013666 |       | AND SB177   | DELETE LAST CHARACTER        |
| 0535 | 15615 | 027573 |       | JMP SPRO1   | STORE NEXT-TO-LAST CHARACTER |

0536\*

0537\* THIS SECTION PUTS COUNT IN A AND RETURNS TO P+2

0538\*

|      |       |        |       |             |                              |
|------|-------|--------|-------|-------------|------------------------------|
| 0539 | 15616 | 067655 |       | LDB SM2     | SET DELETE STATUS            |
| 0540 | 15617 | 060001 | SCMPL | LDA 1       | PUT CHARACTER COUNT INTO (A) |
| 0541 | 15620 | 037537 |       | ISZ SPROC   |                              |
| 0542 | 15621 | 127537 |       | JMP SPROC,I |                              |

0544\*

0545\* SUBROUTINE GETCH

0546\*

0547\* RETURN TO P+1 ON EMPTY BUFFER  
 0548\* IF THE BUFFER IS NOT EMPTY, ELSE  
 0549\* RETURN TO P+2 WITH CHARACTER IN (A).

0550\*

|      |       |        |       |             |                                  |
|------|-------|--------|-------|-------------|----------------------------------|
| 0551 | 15622 | 000000 | SGTCH | NOP         |                                  |
| 0552 | 15623 | 057676 |       | CPB SCNT    |                                  |
| 0553 | 15624 | 127622 |       | JMP SGTCH,I | BUFFER EMPTY, P+1 RETURN         |
| 0554 | 15625 | 163675 |       | LDA SBDDR,I | GET TWO CHARACTERS               |
| 0555 | 15626 | 006011 |       | SLB,RSS     |                                  |
| 0556 | 15627 | 001727 |       | ALF,ALF     | B EVEN, POSITION CHARACTER RIGHT |
| 0557 | 15630 | 006014 |       | SLB,INB     | CHECK O/E, AND INDEX COUNT       |
| 0558 | 15631 | 037675 |       | ISZ SBDDR   | B ODD, INCREMENT ADDRESS POINTER |
| 0559 | 15632 | 013666 | SFASH | AND SB177   | STRIP LEFT CHARACTER             |
| 0560 | 15633 | 033667 |       | IOR SB200   | ADD BIT 7                        |
| 0561 | 15634 | 037622 |       | ISZ SGTCH   |                                  |
| 0562 | 15635 | 127622 |       | JMP SGTCH,I | RETURN TO P+2                    |



0564\*

0565\* INITIALIZES FOR OUTPUTTING A RECORD

0566\*

|      |       |        |       |             |                              |
|------|-------|--------|-------|-------------|------------------------------|
| 0567 | 15636 | 000000 | SINIT | NOP         |                              |
| 0568 | 15637 | 002320 |       | CCE,SSA     | SET E=1, CHECK FOR (A) < 0   |
| 0569 | 15640 | 003104 |       | CMA,CLE,INA | SET (E) = 0, (A) = -(A)      |
| 0570 | 15641 | 073676 |       | STA SCONT   | SAVE CHARACTER COUNT         |
| 0571 | 15642 | 077675 |       | STB SBDDR   | SAVE BUFFER STARTING ADDRESS |
| 0572 | 15643 | 002002 |       | SZA         |                              |
| 0573 | 15644 | 006002 |       | SZB         | LEADER/TRAILER ONLY?         |
| 0574 | 15645 | 027651 |       | JMP *+4     | NO                           |
| 0575 | 15646 | 063670 |       | LDA SCLA1   | YES, (B) = 0                 |
| 0576 | 15647 | 073633 |       | STA SFNSH+1 | SET CLEAR INSTRUCTION        |
| 0577 | 15650 | 000040 |       | CLE         | SET NO CR/LF                 |
| 0578 | 15651 | 006400 |       | CLB         | INITIALIZE OUTPUT COUNT      |
| 0579 | 15652 | 127636 |       | JMP SINIT,I |                              |

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0581*
0582* COMMON DRIVER CONSTANTS AND ADDRESSES
0583*
0584 15653 177765 SM11 DEC -11
0585 15654 177775 SM3 DEC -3
0586 15655 177776 SM2 DEC -2
0587 15656 000002 S.2 DEC 2
0588 15657 000003 S.3 DEC 3
0589 15660 000012 SLNFD OCT 12 LINE FEED
0590 15661 000015 SCRTN OCT 15 CARRIAGE RETURN
0591 15662 000033 SEMDE OCT 33 ESCAPE
0592 15663 000137 SLFTA OCT 137 LEFT ARROW
0593 15664 000175 SOMDE OCT 175 OBSOLETE ALT MODE
0594 15665 000176 SAMDE OCT 176 ALT MODE
0595 15666 000177 SB177 OCT 177 RUBOUT
0596 15667 000200 SB200 OCT 200
0597 15670 002400 SCLAI CLA
0598 15671 033667 SICRI IOR SB200 ADD IN BIT 7
0599*
0600 15672 015673 SCRLA DEF SCRLF
0601 15673 106612 SCRLF OCT 106612
0602*
0603 15674 000000 SBFSA NOP INITIAL BUFFER ADDRESS
0604 15675 000000 SBDNR NOP CURRENT BUFFER ADDRESS
0605 15676 000000 SCCNT NOP HOLDS RECORD LENGTH
0606 15677 000000 SECTC NOP END-OF-TAPE COUNTER
0607*
0608 END
** NO ERRORS*

```